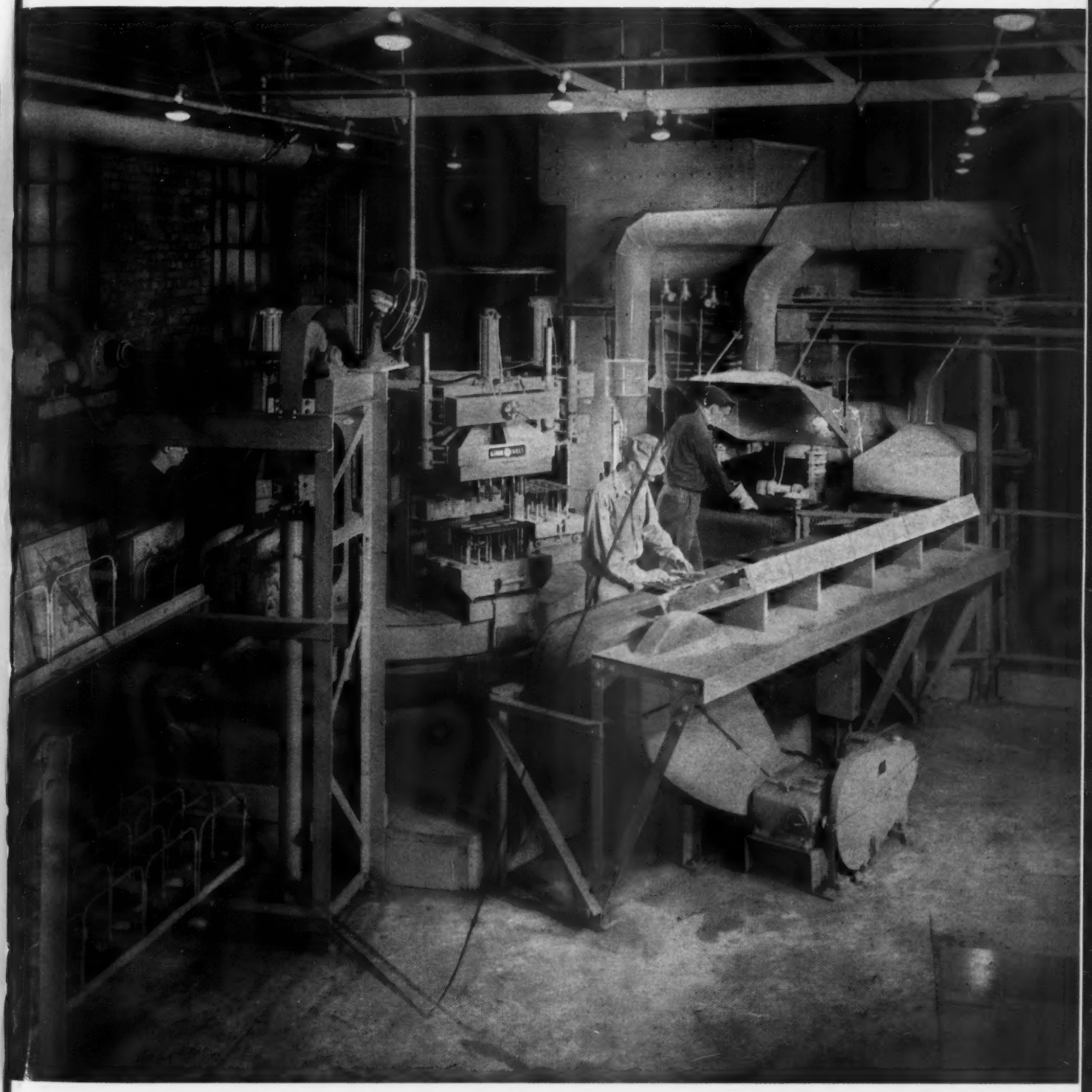
APRIL 1955

# FOUNDRY

...WHEREVER METALS ARE CAST



**TITANIUM IN CAST IRON**
*How It Affects Properties*

**ANY BLUE CHIP FOUNDRIES?**
*Problems in Attracting Capital*

**STEEL PENETRATION**
*Factors in Causing It*

✔ **NEW SHELL MOLDING FOUNDRY**
*Producing Malleable Castings*

✔ **WEST COAST DIE CASTERS**
*Some of the Outstanding Shops*

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... for 100% fluxing action in the cupola

PURITE

... for 100% desulphurizing action in the ladle

1. Purite produces higher percentages of finished castings—fewer rejects per ton of metal poured.
2. Purite is time-tested and proved for rapid and unsurpassed desulphurizing uniformity.
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4. Purite is 100% pure fused soda ash—you do not pay for inert materials.
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Purite, the scientific flux for better melting and cleaner iron, is sold by leading foundry supply houses in the United States and Canada.

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INDUSTRIAL CHEMICALS DIVISION • BALTIMORE 3, MD.

# *Hot under the collar*

## *...or Chuck Wright's key to top performance*

"PANCAKE DAY... the Tuesday before Lent . . . opened bright and sunny. But to Ernie Burgess, Nonesuch Foundry's super., it was a bleak morning," announced Chuck Wright.

"When I stepped into his office," added the INCO distributor foundry specialist, "Ernie was patting a handkerchief to the back of his neck. He looked like a man who could really use a pancake today. For a poultice.

"All I could do was ask: 'What's the strife, Ernie?'

" 'One of our best customers,' he complained, 'one of our largest users of compressor cylinder castings . . . pffft . . . right out the window.'

"Not a pleasant surprise, I thought, to lose that business. And they lost it in spite of technical progress made in this foundry over the past several years.

"It was another case of too many rejects. Hard spots, porosity, lack of uniform, close grain lost it. The customer needed pressure tightness in the cylinders. Plus good machinability, and wear resistance.

"I pointed out to Ernie that he might possibly get these properties by maintaining precise control of the basic chemical composition, the pouring temperature, the sand condition and so forth. I realized, of course, that holding all these to very narrow limits is a terrific gamble for anybody.

"But no foundryman needs to gamble . . . not even with a single heat. So I said to Ernie, 'You know I've told you before how to get exactly what this buyer wants. Relax, man. Use a little nickel.'

"Ernie followed my suggestions. He added 1 to 1½% nickel. From this mix, he shipped a few sample castings to the former customer.

"And here's what happened. Ernie has the customer back on the order book again and Nonesuch is getting new business from other accounts. Every one of them calling for castings that not only machine readily, but also to meet other specific demands. They want wear resistance, higher strength and the like . . . for end-uses requiring top performance.

"There's been a lot of progress made in foundry technique. But after all, you'll find that use of a little nickel will stop a lot of troubles . . . in the machine shop as well as in the foundry and in the field.

"Next time there's a hitch in your work, you may want some practical answers on the metallurgy of castings. Just call on me for help."

Chuck Wright

**P. S.** "The easiest way is to drop me a line in care of INCO."

INCO TRADE MARK

The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

Taking a *"thumping"* from lumpy shakeout? Don't worry! There's a sure way out! Adding Federal SAND STABILIZER (a processed cellulose sand additive) to your sand, dry or in slurry, will give you a better, less lumpy shakeout, *without* adding other clays to your sand mixture. For, among the many advantages afforded by this highly efficient sand additive is its ability to eliminate lumps in sand shakeout and improve core knockout.

In addition to improving shakeout, you'll find, during the pouring period, that Federal SAND STABILIZER burns out at a much faster rate than any other type of facing material. Since it has a very low ash content and has no deteriorating effect on sand, the re-use of your molding sand can be practiced with *complete safety*.

Federal SAND STABILIZER greatly improves the flowability of sand, too—providing much better ramming conditions. When added to facing or backing sand, more uniformly rammed mold surfaces will be obtained, thus providing smoother casting finish. When added to bentonite slurry, STABILIZER sharply reduces viscosity of solution, permitting the addition of more bentonite to the slurry for greater strength, if desired.

Yes, Federal SAND STABILIZER can be a big help to you! Especially so, if used along with Federal's CROWN HILL SEACOAL—the low sulphur seacoal, and GREEN BOND BENTONITE—the long-lasting bentonite. These three outstanding sand additives will really give you easy, uniform, *thoroughly dependable* sand control. To learn more about them, write for Federal's bulletin: "Tailor-Made Molding Sands".

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# FOUNDRY

April 1955

Volume 83—Number 4



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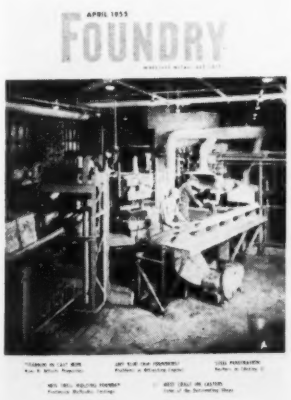

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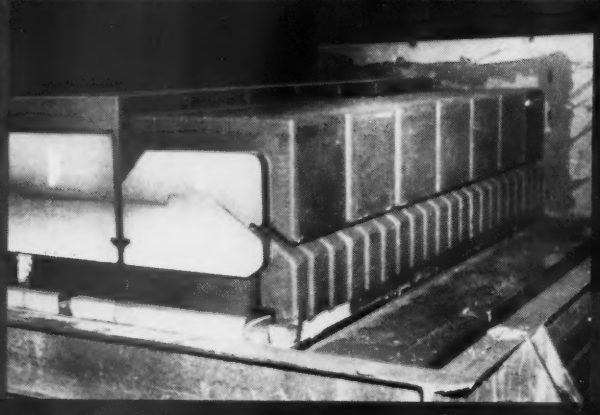
fast bake

Inside view of base casting by
RIVERSIDE IRON WORKS
*Chicago, Illinois*

best illustrates the open construction which calls for extreme care and standardization of core technique. Both the interior and the face of this casting are cored. Finish dimensions are: 19 feet long, 54 inches wide, and 36 inches high. The complete spar mill base, when assembled in the aircraft plant, consists of six of these castings in length and two in width.

Side view of same 12-ton base casting illustrated on left hand page shows full 19 ft. expanse with 13 cored openings.



Core assembly close-up of a 6-ton spar mill base similar to the heavier base. Here core molds are assembled and pouring is done on the floor. A slinger is used to ram back-up sand behind core assembly and along outer edges of the mold.

# ke..low gas content...make

# Inductol

## ideal for aircraft spar mill bases!

. . . or, for that matter, *any* machine tool casting calling for heavy chunk cores . . . and lots of them.

In this case, Riverside Iron Works, Chicago, uses INDUCTOL-mixed cores in producing huge 12-ton base castings for aircraft spar milling machines.

Intricately ribbed and "wide open," these bases are a challenge to craftsman-like core work since every set of core molds weighs over 53,000 lbs.

Riverside has always specified INDUCTOL for heavy, yet complicated, castings due to its fast baking time and low gas content. Other benefits are improved collapsibility and added green strength.

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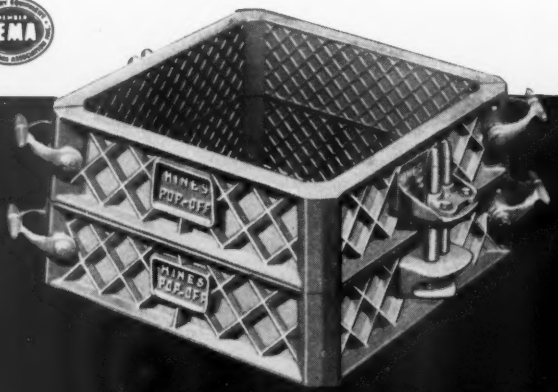


If you're not fully acquainted with the advantages of HINES POP-OFF FLASKS, please write us for complete information.

# then think of this, too..

## the HINES flask co.

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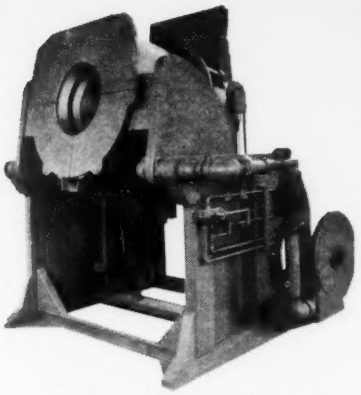

Lindberg-Fisher type HNP Hydraulic Nose-Pour Tilting Crucible Furnace. Pouring lip is located in the axis of tilting providing a constant pouring arc regardless of degree of furnace tilt. Capacities up to 1000 lbs. of aluminum. Oil or gas fired. Described in Bulletin 57-A.

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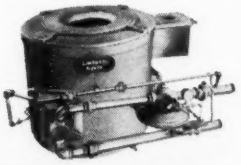

Lindberg-Fisher type ADC Aluminum Melting and Holding Furnace. Capacities up to 1000 lbs. of aluminum. Oil or gas fired. Described in Bulletin 301.

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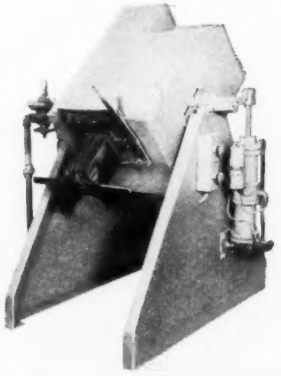

Lindberg-Wessel Casting Machine produces quality aluminum castings on a semi-automatic basis using either graphite or steel molds which are attached to the machine. Described in Bulletin LW.

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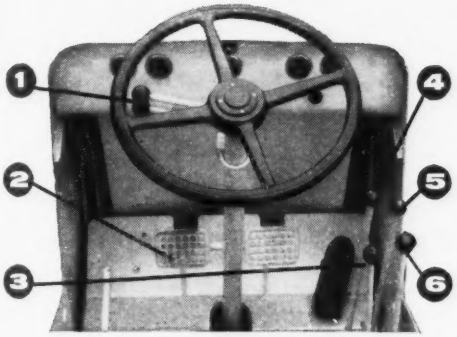


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A demonstration (on your own job, if you wish) is the only way to get a real understanding of what this machine can do! Just write or call us—and don't forget that all MICHIGAN's are available on the low-cost MICHIGAN Lease Plan.

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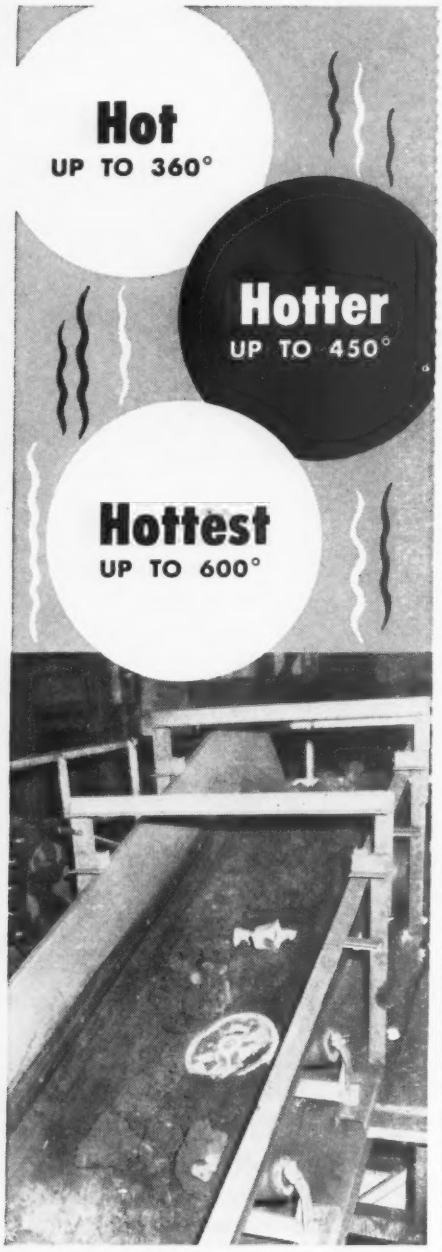


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# WITH THE EDITORS

**REPORT ON PROGRESS:** When "in spring a young man's fancy lightly turns to thoughts of love," foundrymen begin thinking about the annual technical meetings that are staged by the AFS, and the progress and developments in foundry practice that may be discussed during the convention year. As a prelude to the discussions which will take place at Houston, Tex., May 23-27, the editors of FOUNDRY have asked a number of authorities in various fields to report on the progress that has been made in five of the important phases of foundry practice. These special features covering molding, melting, metals, heat treatment and testing will be published in the May, preconvention issue.

Subjects to be discussed and authors are as follows:

**Molding**

Shell—J. E. Bolt, General Electric Co., Pittsfield, Mass.
Pressure—T. E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago
Investment—Ted Operhall, Misco Precision Casting Co., Whitehall, Mich.
Centrifugal—Dr. A. E. Schuh, U. S. Pipe & Foundry Co., Burlington, N. J.
Die Casting—J. C. Fox, die casting consultant, Toledo, O.
Gating—J. G. Kura, Battelle Memorial Institute, Columbus, O.
Permanent—Alfred Sugar, Alloys & Chemicals Mfg. Co. Inc., Cleveland
Patternmaking—John F. Roth, Cleveland Standard Pattern Co., Cleveland

**Melting**

Basic Cupola—C. K. Donoho, American Cast Iron Pipe Co., Birmingham, Ala.
Hot Blast Cupola—G. P. Phillips, International Harvester Co., Chicago
Vacuum Furnace—W. S. Pellini, Naval Research Laboratory, Washington, D. C.

**Metals**

Pearlitic Malleable—Dr. W. K. Bock, National Malleable & Steel Castings Co., Cleveland
Nodular Iron—T. E. Eagan, Cooper-Bessemer Corp., Grove City, Pa.
High-Alloy Steel—C. K. Lockwood, Stainless Steel & Alloys Division, Shawinigan Chemicals Ltd., Montreal, Que., Canada
Bronzes—J. S. Vanick, International Nickel Co., New York
Aluminum—Floyd Lewis, the Aluminum Association, New York
Magnesium—Dr. T. E. Leontis, Dow Chemical Co., Midland, Mich.
Titanium—R. E. Edelman, Frankford Arsenal, Philadelphia

**Heat Treatment**

Malleable Iron—Milton Tilley, National Malleable & Steel Castings Co., Cleveland
Steel—C. B. Jenni, General Steel Castings Co., Eddystone, Pa.
Gray Iron—Charles F. Walton, Gray Iron Founders' Society, Cleveland
Copper-Base Alloys—R. A. Colton, Federated Metals Division, American Smelting & Refining Co., Newark, N. J.
Aluminum Alloys—D. L. LaVelle, Federated Metals Division, American Smelting & Refining Co., Perth Amboy, N. J.

**Testing**

Magnaflux Testing—Frank Catlin, Magnaflux Corp., Chicago
X-ray & Gamma Ray Testing—R. G. Tobey, Eastman Kodak Co., Rochester, N. Y.

I believe you will find these articles of major interest.

—o—

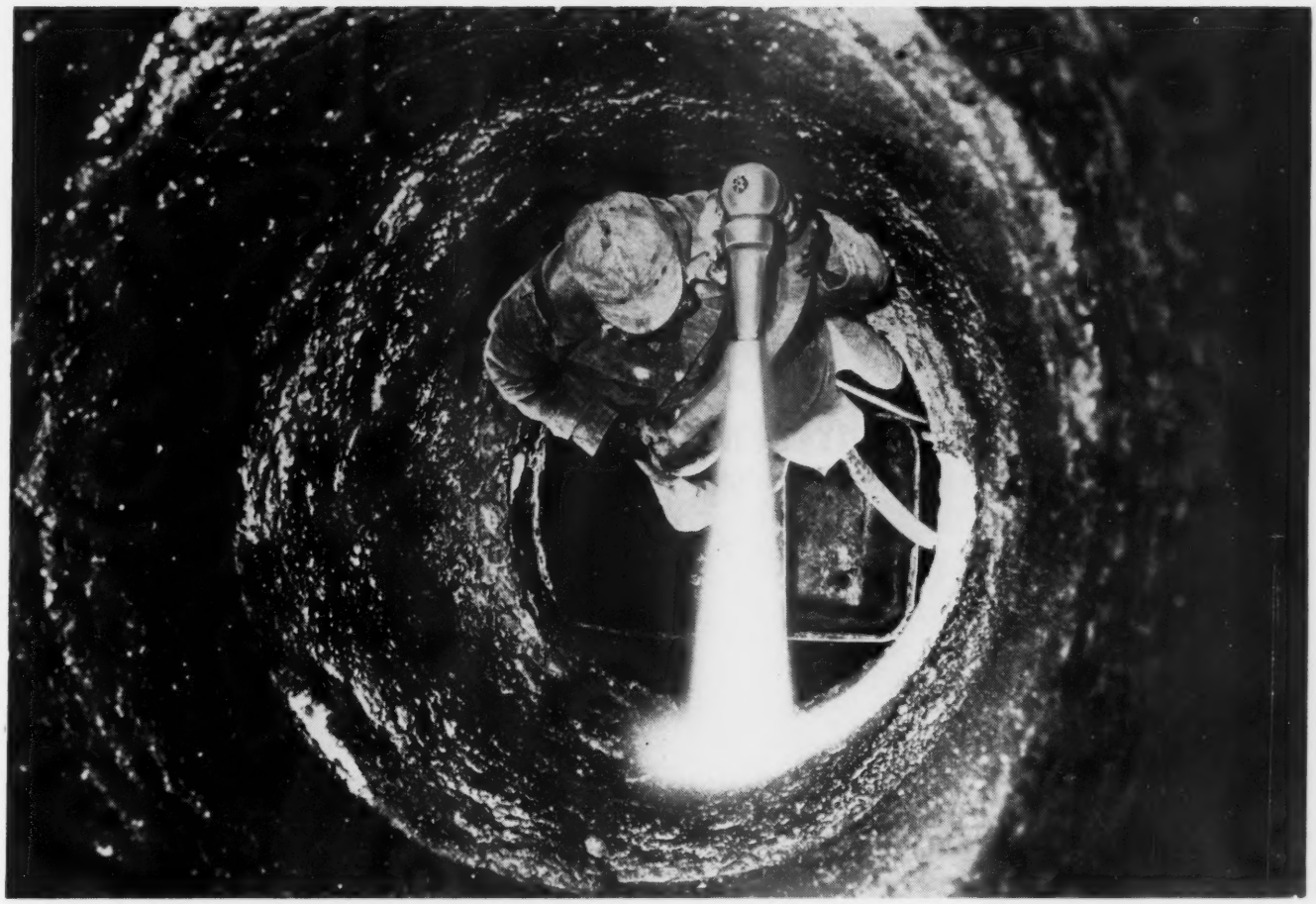
**Plans for Houston:** In addition to this interesting report, the preconvention issue also will include information on the various convention activities, including the program of technical meetings and special events, sketches of the men who will receive gold medals and honorary life memberships at the annual dinner on Wednesday, May 25, and information on the committees of the Texas Chapter, convention hosts. And we understand the real western barbecue being staged by the Texas Chapter on Thursday night of the convention will be a dillie.

If you plan to attend the convention, the May issue will give an idea on what to expect. If you had not planned to take in the meeting this year, perhaps the material the editors have assembled for that issue may cause a change in plans.

At any rate, be looking for it about May 1.

—o—

**Series on Nonferrous Practice:** During the past few weeks, I have been discussing the possibility of an extensive series of articles on copper-base nonferrous practice with a foundryman having years of experience in the field. The project is taking definite shape, the various articles are being outlined, and the actual writing probably will get under way shortly. The editors hope that the first of this interesting and valu-



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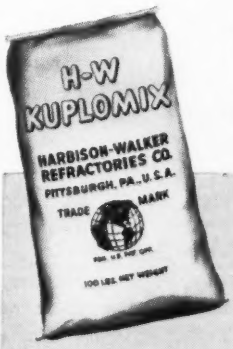
Please write for complete information about H-W KUPLOMIX, the modern service-proved cupola refractory.

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THE **WELLMAN** BRONZE & ALUMINUM CO.
Dept. 7, 12800 Shaker Boulevard Cleveland 20, Ohio

able series will be ready for publication in the fall. More details will be provided later.

—o—

**Steel Foundry Practice:** Speaking of articles, the series by the late John Howe Hall, which ran in FOUNDRY over a period of several years, now is in process of being published in book form. This should be printed, bound and available for distribution in about two months.

—o—

**PFL Moving Forward:** One more item about our activities, and then I will find another subject. Work on the 1955-56 edition of *Penton's Foundry List* is moving forward according to schedule. Most foundries have provided excellent co-operation, and the data collected by questionnaires is being tabulated. The directory will be ready around the middle of the summer, and at about the same time FOUNDRY will publish the tabulation of foundry statistics by states and individual industries.

—o—

**Maintaining the Tradition:** During February I visited both the Wisconsin Regional Conference at Milwaukee and the Southeastern Regional Conference at Birmingham. It is interesting to note how these two affairs, first staged years ago, have continued to provide good programs and an excellent attendance year after year. Both had origins before the AFS chapter movement got under way.

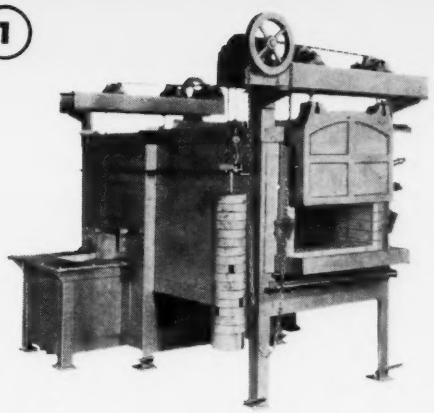
The first regional type foundry conference in Wisconsin was held at the University of Wisconsin, Madison, Feb. 5-8, 1929, and was organized by the Extension Division and the Department of Mining and Metallurgy of the university. The affair was repeated on Feb. 4-6 of the following year, and I conducted one session devoted to certain phases of foundry management.

The first conference in Birmingham was held Feb. 13-14, 1933 under the auspices of the Birmingham Section of the American Society of Mechanical Engineers and the local members of the American Foundrymen's Association.

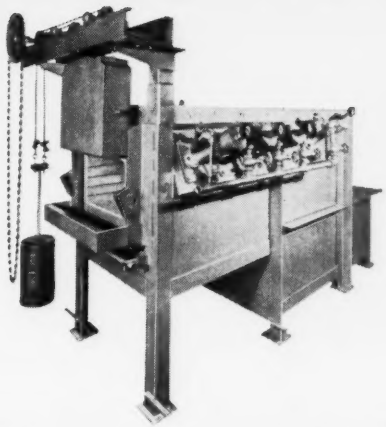
On Apr. 6-8 of that year, Michigan State College, East Lansing, Mich., also held the first foundry conference in that region.

When chapters were formed, they took over the organization of these conferences. To the officers, directors and committee members who carry on the organization and staging of these yearly technical meetings, congratulations.

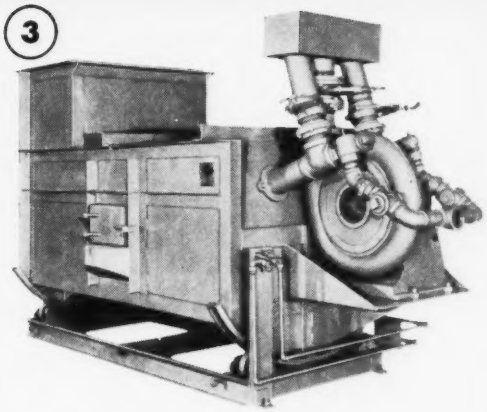
F.G.S.



B&W Allmul forms the durable lining in this Eclipse, two side dip out, gas-fired, 1000-pound-per-hour, dry hearth reverberatory furnace for aluminum and aluminum alloy die cast work.



Another furnace made by the Eclipse Fuel Engineering Co. of Rockford, Ill., with B&W Allmul lining. This model is similar to the one above but is of straight-through design instead of side dip out.



B&W Allmul in this tilt-type, gas-fired Eclipse reverberatory furnace for melting iron, brass or aluminum, is subject to melting temperatures of 3000F at the arch and 2800F in the bath.

Eclipse

**Eclipse Fuel Engineering Co. Uses**

## B&W ALLMUL FIREBRICK

# for Tough, High Temperature Service

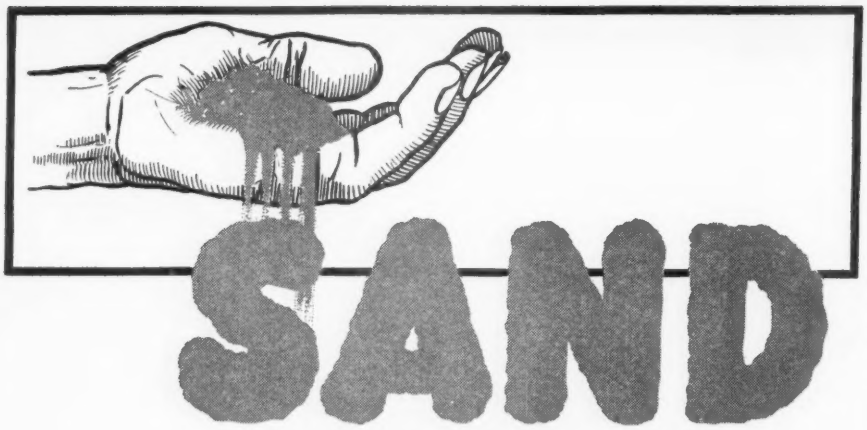
The hard, dense structure of B&W Allmul . . . its high melting point, 3335F . . . its resistance to spalling . . . low and uniform reversible thermal expansion . . . exceptional volume stability . . . high hot load strength and slag resistance all help to make it an ideal refractory for furnace linings subject to tough service.

Because B&W Allmul is volume produced from electrically melted grain by a highly efficient process, this top quality mullite brick is practical, from a cost standpoint, for a wide range of applications. For instance: butt welding furnaces, billet heating furnaces, electric furnace roofs, and reverberatory melting furnaces, to name a few.

May we submit detailed information? Ask your B&W Representative, or write requesting Bulletin R-34.

**B&W REFRACTORIES PRODUCTS:** B&W Allmul Firebrick • B&W 80 Firebrick
B&W Junior Firebrick • B&W Insulating Firebrick • B&W Refractory Castables, Plastics and Mortars
**OTHER B&W PRODUCTS:** Stationary & Marine Boilers and Component Equipment
Chemical Recovery Units • Seamless & Welded Tubes • Pulverizers • Fuel Burning Equipment
Pressure Vessels • Alloy Castings

**BABCOCK & WILCOX**
THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 161 EAST 42ND ST., NEW YORK 17, N.Y.
WORKS: AUGUSTA, GA.



# SAND

## PRODUCERS OF:

**MANKO DRIED & SCREENED SILICA SAND:**
Grain Fineness 50-75

**MANKO SILICA FLOUR:**
Foundry Grade—140 Mesh

**MB DRIED & SCREENED LAKE SAND:**
Grain Fineness 48-52

**MICHIGAN CITY DRIED & SCREENED LAKE SAND:**
Grain Fineness 53-55

**MICHIANA DRIED & SCREENED LAKE SAND:**
Grain Fineness Approx. 70

**HIGH DENSITY BLENDED DRIED & SCREENED LAKE SANDS:**
Grain Fineness 55-65

**LIME FREE SAWYER SCREENED LAKE SAND:**
Pit Moisture—Open or Closed Cars

**MICHIGAN CITY SCREENED LAKE SAND:**
Pit Moisture—Open or Closed Cars

**DUNE PARK SCREENED LAKE SAND:**
Pit Moisture—Open or Closed Cars

**GARY SCREENED LAKE SAND:**
Pit Moisture—Open or Closed Cars

**MICHIANA SCREENED BANK SAND:**
Grain Fineness Approx. 70—Open or Closed Cars

**WABASH SCREENED BANK SAND:**
Grain Fineness 80-100—Pit Moisture—Open or Closed Cars

## DISTRIBUTORS OF:

**RED CEDAR DRIED, MILLED & SCREENED MOLDING SAND:**
Tennessee—Approx. Permeability Range 190-470

**CYPRESS DRIED, MILLED & SCREENED MOLDING SAND:**
Tennessee—Approx. Permeability Range 7-160

**MAPLE DRIED, MILLED & SCREENED MOLDING SAND:**
Indiana—Approx. Permeability Range 4-70

**SWEDEN DRIED, MILLED & SCREENED MOLDING SAND:**
Indiana—Approx. Permeability Range—80-100

**VOLCLAY WESTERN BENTONITE**

**PANTHER CREEK SOUTHERN BENTONITE**

**KIOWA DRIED & SCREENED SILICA SAND:**
Grain Fineness—35-90

**KIOWA 100 DRIED & SCREENED SILICA SAND:**
Shell Molding—D Process—Velvet Finish Cores

**LYLE T. MANLEY**
**COMPANY**

**MANLEY BROTHERS**
**INCORPORATED**

•

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**GARY, INDIANA**

**TELEPHONES**
ROCKTON 2-4221, 2-5581, 2-8511

OGDEN DUNES 2925, 3820


## MEETING CALENDAR

**Apr. 4-6—National Fluid Power Association,** spring meeting, Broadmoor Hotel, Colorado Springs, Colo.

**Apr. 7-8—Malleable Founders' Society,** market development conference, Edgewater Beach Hotel, Chicago.

**Apr. 15—Foundry Equipment Manufacturers Association,** spring meeting, Sheraton-Carlton Hotel, Washington.

**Apr. 18-20—American Institute of Mining & Metallurgical Engineers,** national open hearth conference, Bellevue-Stratford Hotel, Philadelphia.

**Apr. 27-29—Society for Experimental Stress Analysis,** spring meeting, Hotel Statler, Los Angeles.

**Apr. 28-29—Society for Advancement of Management and American Society of Mechanical Engineers,** time study and methods conference, Hotel Statler, New York.

**May 16-18—Industrial Heating Equipment Association,** spring meeting, The Homestead, Hot Springs, Va.

**May 16-20—Sixth National Materials Handling Exposition,** International Amphitheater, Chicago.

**May 19-21—Non-Ferrous Founders' Society,** annual meeting, Congress Hotel, Chicago.

**May 22-26—Air Pollution Control Association,** 48th annual meeting, Detroit.

**May 23-25—American Management Association,** general management conference, Roosevelt Hotel, New York.

**May 23-27—American Foundrymen's Society,** 59th annual convention, Houston, Tex.

**June 7-10—American Welding Society,** national spring meeting and exposition, Municipal Auditorium, Kansas City, Mo.

**June 16-18—Malleable Founders' Society,** annual meeting, the Greenbrier, White Sulphur Springs, W. Va.

**June 26-28—Alloy Casting Institute,** annual meeting, The Homestead, Hot Springs, Va.

**June 26-July 1—American Society for Testing Materials,** annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, N. J.

**July 12-14—Western Plant Maintenance Show,** Pan-Pacific Auditorium, Los Angeles.

**Sept. 6-17—National Machine Tool Builders Association,** machine tool show, International Amphitheater, Chicago.

**Sept. 6-17—Production Engineering Show,** Navy Pier, Chicago.

**Sept. 12-16—Instrument Society of America,** instrument conference and exhibit, Shrine Exposition Hall and Auditorium, Los Angeles.

**Oct. 6-7—National Foundry Association,** annual meeting, Edgewater Beach Hotel, Chicago.

**Oct. 13-15—Foundry Equipment Manufacturers Association,** annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

**Oct. 16-18—Conveyor Equipment Manufacturers Association,** annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

**Oct. 17-18—American Coke & Coal Chemicals Institute,** annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

**Oct. 17-21—American Society for Metals,** national metal exposition and congress, Convention Hall, Philadelphia.

**Oct. 19-21—Gray Iron Founders' Society,** annual meeting, Schroeder Hotel, Milwaukee.

**Oct. 20-21—Missouri Valley Regional Foundry Conference,** sponsored by St. Louis, Tri-State, and Mo-Kan Chapters of AFS and Missouri School of Mines Student Chapter, at Missouri School of Mines and Metallurgy, Rolla, Mo.

**Oct. 24-25—Steel Founders' Society of America,** fall meeting, The Greenbrier, White Sulphur Springs, W. Va.

**Nov. 1-3—Grinding Wheel Institute and Abrasive Grain Association,** fall meeting, Statler Hotel, Buffalo.

**Nov. 14-16—National Metal Trades Association,** annual convention, Hotel Commodore, New York.

**Nov. 14-17—Second International Automation Exposition,** Navy Pier, Chicago.

**Nov. 16-18—Steel Founders' Society,** annual technical and operation conference, Hotel Carter, Cleveland.

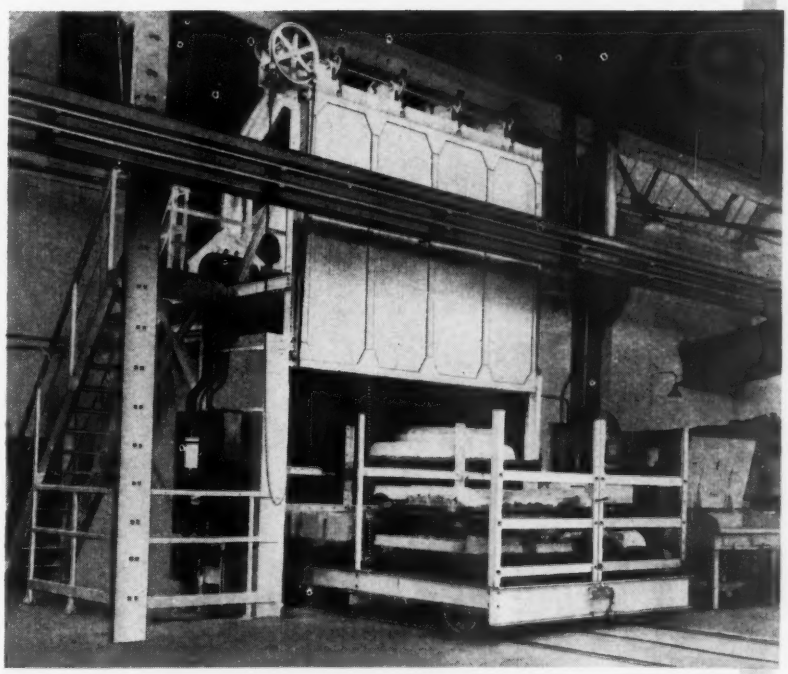
**Nov. 16-19—Society for Experimental Stress Analysis,** annual meeting and exhibit, Sherman Hotel, Chicago.

**Dec. 1-2—Michigan Regional Foundry Conference,** Michigan State College, East Lansing, Mich.

**Dec. 7-9—American Institute of Mining & Metallurgical Engineers,** electric furnace steel conference, Hotel William Penn, Pittsburgh.

*Performance records prove*

# COLEMAN OVENS
## reduce foundry costs



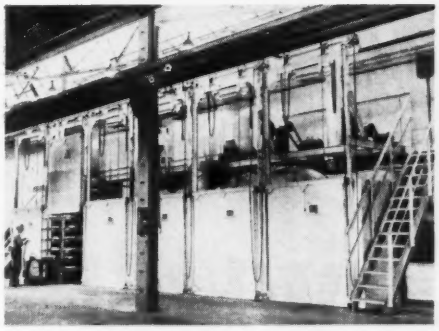
Coleman Car-Type Oven

**Coleman Core and Mold Ovens reduce foundry costs by producing more efficiently . . . more dependably . . . year after year. They are as fine as modern engineering can make them because they are the result of *MORE THAN A HALF A CENTURY* of specialized foundry oven experience.**

**Statements like these from foundrymen everywhere prove that Coleman Ovens are vital to more profitable operations:—**

*". . . we are getting smoother castings and a reduction of our scrap casting losses." — ". . . we are able to turn out 25% more cores with the same amount of labor." — "We have perfectly dried molds everytime." — "It saved us a lot of money and headaches" — "the resultant cores are more uniformly baked and our entire operation is more economical."*

**Actual performance records prove that Coleman Ovens may reduce overall core department costs by as much as 50%! Such savings mean increased profits and rapid amortization of investment. Many Coleman Ovens have paid for themselves in less than a year!**



Coleman Transrack Ovens

Coleman Tower® Oven

Coleman Dielectric Oven

**With production savings so important to profits, it will pay you to investigate the unusual advantages of Coleman Ovens now! For better castings at lower cost let our experienced Engineers give you practical recommendations for your particular requirements.**

***AS BUILDERS OF THE WORLD'S ONLY COMPLETE LINE OF FOUNDRY OVENS, WE HAVE NO REASON TO RECOMMEND ANY BUT THE BEST OVEN SUITED TO YOUR PURPOSE.***

**WRITE FOR BULLETIN 54**

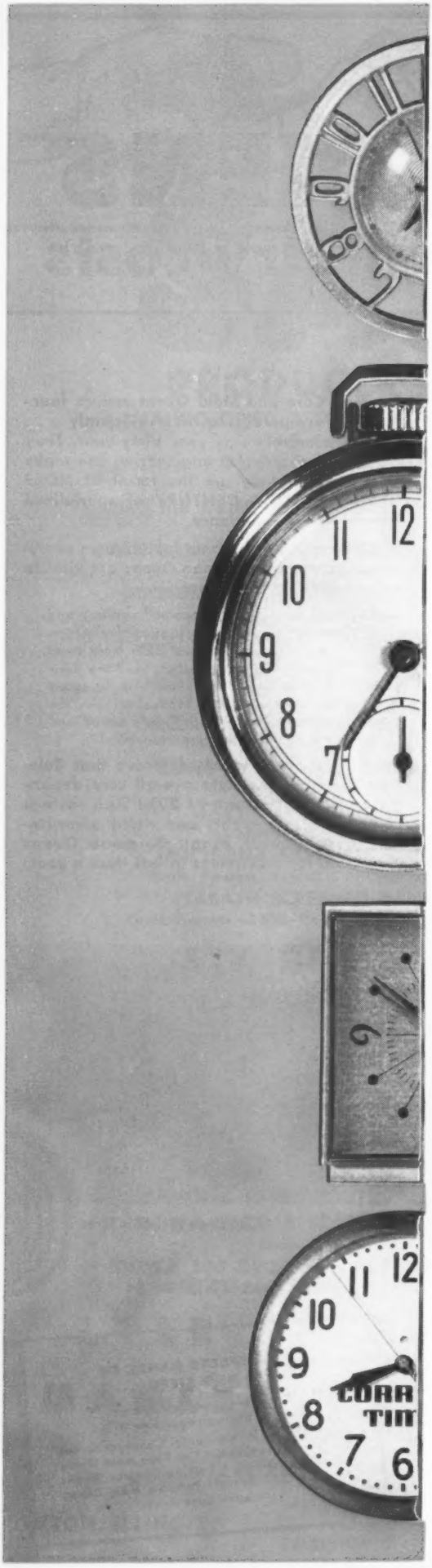
**A COMPLETE RANGE OF TYPES AND SIZES . . .**

*for every core baking and mold drying requirement:*

Tower Ovens • Horizontal Conveyor Ovens
Car-Type Core Ovens • Car-Type Mold Ovens
Transrack Ovens • Rolling Drawer Ovens
Portable Core Ovens • Portable Mold Dryers
Dielectric Core Ovens

**THE FOUNDRY EQUIPMENT COMPANY**
**1821 COLUMBUS ROAD** **CLEVELAND 13, OHIO**

***WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS***




# How to really cut snagging time in your cleaning room!

switch to

# CINCINNATI PD Snagging Wheels

CHECK UP on the amount of time your cleaning room spends in snagging. You may find, like so many foundry men, that wasted snagging time is cutting sharply into your profits. And like more and more foundries every day, you'll want to switch to CINCINNATI (PD) SNAGGING WHEELS—the greatest grinding wheel development in years.

CINCINNATI (PD) WHEELS will absolutely cut snagging time in your cleaning room . . . saving you money four important ways:

- FASTER CUTTING – You can get more pounds of metal per hour with the grains and bonds specified by CINCINNATI for your jobs. Operators like the fast, easy cutting action of CINCINNATI (PD) WHEELS.

- SELF-DRESSING ACTION – The CINCINNATI (PD) WHEELS specified for your job by CINCINNATI abrasive engineers require few, if any, dressings. With the right grade wheel, new cutting grits are bared as soon as old grits get dull and inefficient.

- LONGER WHEEL LIFE – Through longer life of CINCINNATI (PD) WHEELS, users have reported almost *double* the production per wheel. One customer, using a portable grinder, gets almost *twice* the life with a CINCINNATI (PD) Flared Cup. Another user, snagging cylinder blocks on a swing frame, has increased the production per wheel 45% with (PD) WHEELS.

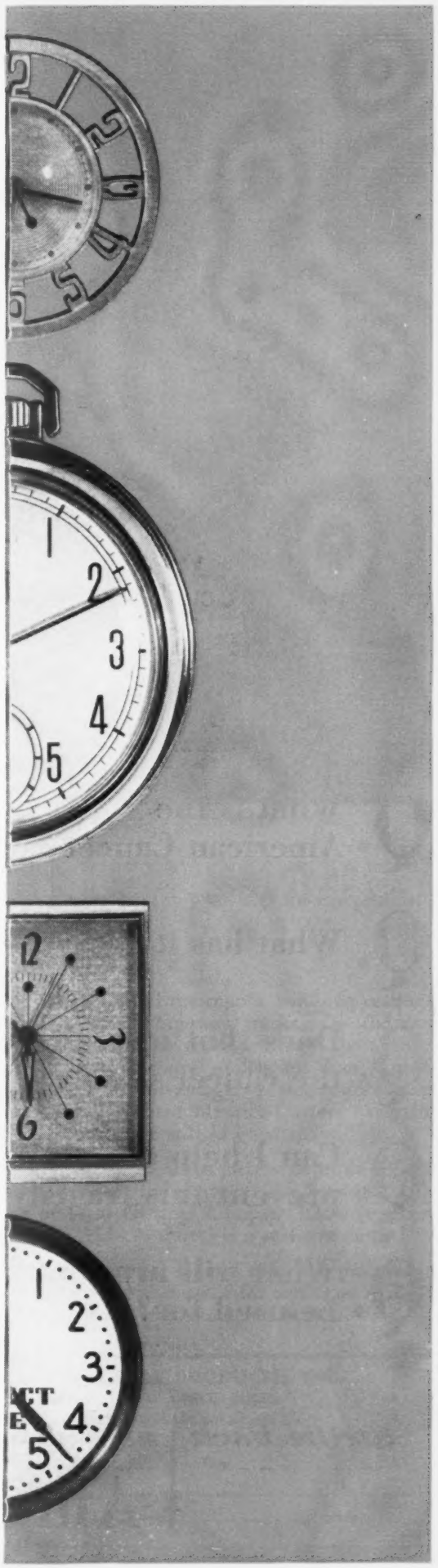
- POSITIVE DUPLICATION (PD) – "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

CINCINNATI (PD) WHEELS are made in vitrified and resinoid bonds for both ferrous and non-ferrous foundries and are available in a complete variety of sizes and shapes. *Yet these better, cost-cutting* CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.*

We'll be happy to prove to you how CINCINNATI (PD) WHEELS can increase your production and cut time and costs in your cleaning room. Just contact us and we'll send one of our representatives. Wire, write or telephone, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

CINCINNATI
*Grinding Wheels*

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.



# a Quiz that may save your life

**Q.** What is cancer?

**A.** An uncontrolled growth of cells. If permitted to spread through the body, it inevitably leads to death.

**Q.** Can cancer be cured?

**A.** Many types can be cured, but only if they are discovered and treated early.

**Q.** How can cancer be discovered in time?

**A.** By your doctor who has available many diagnostic tests.

**Q.** What is the American Cancer Society?

**A.** The only national voluntary agency which fights cancer by research, education and service to cancer's victims.

**Q.** What has it accomplished?

**A.** It helped save an American from dying of cancer on an average of every seven minutes last year.

**Q.** Does that mean it has solved the cancer problem?

**A.** Unfortunately, no. Despite the advances made, more than 235,000 Americans will die of cancer this year.

**Q.** Can I help to prevent this tragedy?

**A.** Yes. By having regular health examinations yourself. And by contributing to the American Cancer Society.

**Q.** What will my contribution be used for?

**A.** For research that may some day save your life, for education and for helping cancer's victims.

***Strike back | at cancer . . . man's cruelest enemy . . . Give***

## American Cancer Society

Photo Courtesy Ideal Castings Co.

# SAVES $24,000 with ALLEN SHOVEL on Clark fork truck!

**IDEAL CASTINGS COMPANY of Albion, Michigan,** specializes in gray iron and alloy iron squeezer castings. In twenty-eight months, its $3,700 investment in a 2000-pound capacity ALLEN-equipped Clark fork truck has resulted in a $24,000 saving in direct wages alone! How's that for a return on your investment?

What's more, where it was formerly impossible to keep men on the job long enough to pay out, the same man has now been on the job more than two years—and likes it—thanks to the ALLEN-equipped fork truck.

The shovel-equipped truck is used eight hours a day—moving sand for the production molders, cleaning up after shake-out, bringing in clay, sand and fire brick, cleaning up refuse around the cupola, handling castings, loading and unloading highway trucks. On the rare occasions when the regular forks are used, the change-over—shovel-to-forks-to-shovel—takes less than 15 minutes, another ALLEN advantage. Maintenance? Says Maintenance Superintendent Maurice Cuyler: "Very little. Shovel and truck are still in good shape."

Smart foundrymen know their success depends on cutting costs—and smart foundrymen like President Lyle M. Johnson of Ideal Castings Company know from experience that an ALLEN shovel is a real cost cutter!

Take the first step toward savings that will put you in a better competitive position—send for details on ALLEN SHOVEL attachments—you can't buy better!

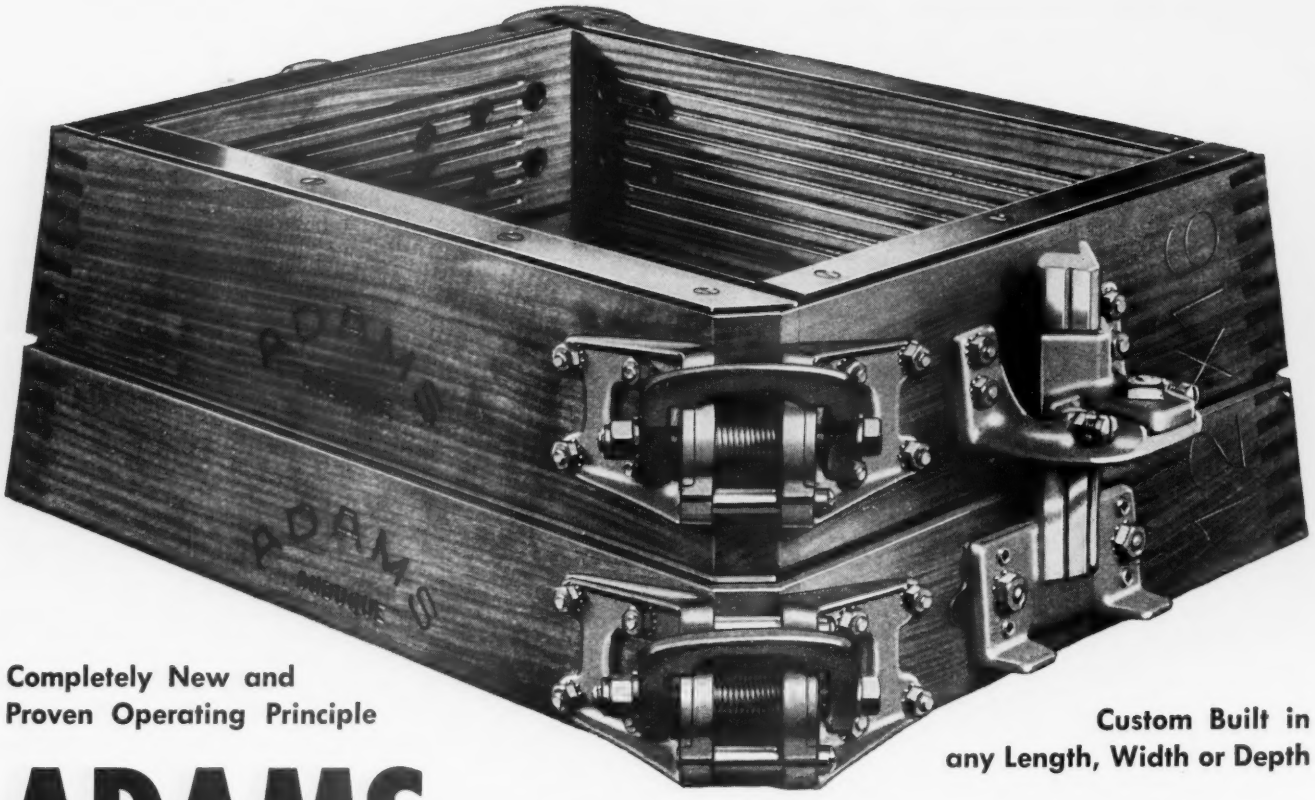
**ALLEN INDUSTRIAL PRODUCTS, INC.**
BATTLE CREEK, MICH.

**America's foremost designers and builders of shovels, snow plows and cabs for industrial trucks.**

**ALLEN INDUSTRIAL PRODUCTS, INC.**
**LIBERTY STREET, BATTLE CREEK, MICH.**

☐ Send complete shovel attachment details.
☐ Send representative.

Name..... Title.....
Company.....
Street..... City..... State.....
Specify make and model of truck.....



Completely New and
Proven Operating Principle

Custom Built in
any Length, Width or Depth

# ADAMS CHERRY EASY-OFF FLASK

## These advantages will cut your production costs!

**SIDES AND ENDS** finished 1⅛" on all standard size flasks. 1¼" and heavier on flasks of larger perimeters and depths. Cherry lumber is finest available; air dried.

**SOLID CORNERS** are machine locked to maintain alignment and to insure maximum rigidity.

**MALLEABLE TRIMMINGS** are another famous Adams feature; assure long life and exceptional service.

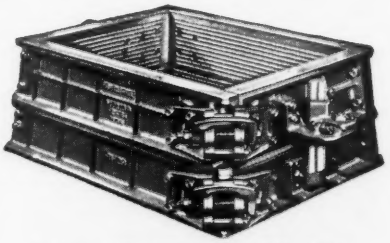
**OPERATING MECHANISMS** are completely new in design, yet of proven construction. Exceptionally simple, offering single-point adjustment; ease of operation on tough jobs.

**ADJUSTMENTS** made *only* when mechanism is in *locked* position.

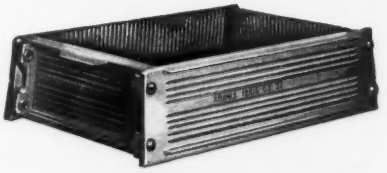
**SPECIALLY DESIGNED INSERTS** located in main body castings permit reversal of locking position. As "standard" flasks are furnished with handles locking in "up" position. To change, remove main bolt handles and inserts, reverse inserts and handles and reassemble.

**STEEL PROTECTING STRIPS** are standard equipment at top of cope, bottom of drag and at parting. Aluminum strips available upon request at no extra charge.

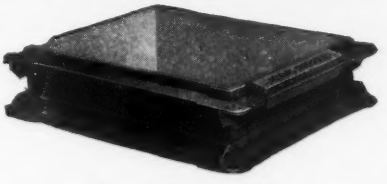
**WIDE "V" PINS & EARS** standard on all flasks. All other types of pin and ear arrangements are available to interchange with your present pattern plate guides.



Adams Aluminum Easy-Off Flask



Adams Jackets, Cast Iron or Aluminum



Adams Steel Jackets

***Write today for full details . . .***

Cherry Snap Flasks—Cherry Slip Flasks—Aluminum Slip Flasks—Easy-Off Flasks
Cherry Presser Boards—Wood Bottom Boards—Steel Bottom Plates—Steel Jackets
Aluminum or Cast Iron Jackets—Steel Bands—Steel Upsets—Cherry or Aluminum Upsets

# The ADAMS Company

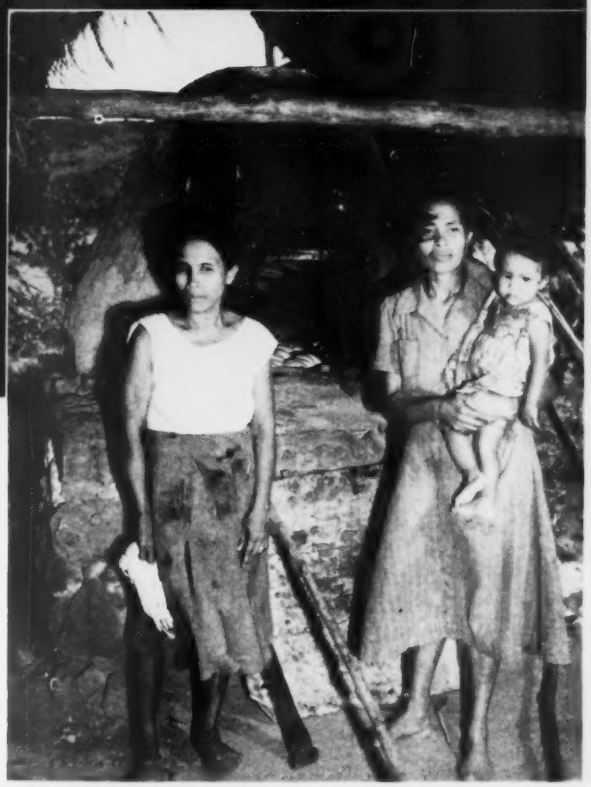
ESTABLISHED 1883

**MOLDING MACHINES and FLASK EQUIPMENT**

**700 FOSTER STREET, DUBUQUE, IOWA, U.S.A.**

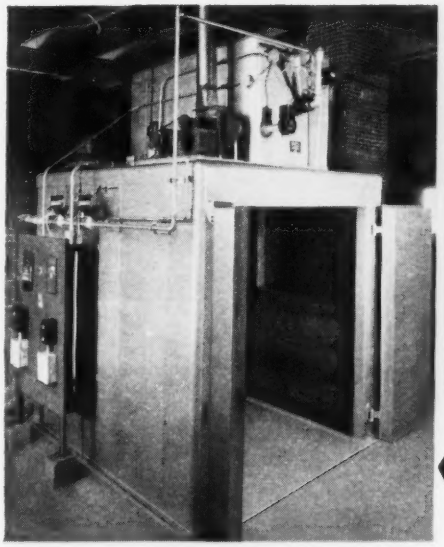
# This **OLD MUD OVEN** still bakes ...but how efficiently?

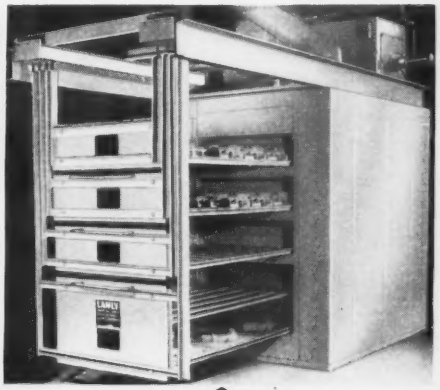
Despite the availability of modern kitchen stoves and ovens, travelers can still view the almost pathetic baking operations of old mud ovens.



## ...even **TODAY,** many Foundries are operating out-dated obsolete core ovens

Outdated, inefficient foundry ovens can drag on production and profit figures in much the same way as old mud ovens hamper volume output and quality on the bread producing line.





1. Drawer Type Oven
2. Single Compartment Rack Type Oven
3. Car Type Oven

Isn't this an opportune time to examine closely the oven facilities of your foundry for a possible improvement? The average foundry requirements can be met with standard LANLY units. Custom designed units for core baking, pasting and mold drying are part of LANLY'S services, as well as ovens for casting conditioning and heat treating.

WRITE FOR THE LATEST CATALOG AND FACTS ON ANY INSTALLATION

LANLY FOUNDRY OVENS

THE LANLY COMPANY • 780 PROSPECT AVE
CLEVELAND, OHIO

## *Remove metal* **FASTER...**

**YOUR CARBORUNDUM DISTRIBUTOR** or salesman offers expert help in selecting the wheels best suited to your operations. He's completely stocked to give you fast, efficient service. Call him today—listed in the yellow pages of your phone book under "Abrasives" or "Grinding Wheels."

**FREE BOOKLET!** "Abrasive Products for the Foundry" gives recommended wheel gradings for various materials, plus detailed information on the complete line of cost-cutting abrasive products by CARBORUNDUM for foundry use. Write The Carborundum Company, Dept. F 81-510, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

*on every* **SNAGGING** *operation*

**CARBORUNDUM'S B5 RESINOID BOND SNAGGING WHEELS,** in both aluminum oxide and silicon carbide, combine uniformly *higher* rate of cut with *longer* life...which means substantial savings in any foundry.

Operators find that snagging wheels by CARBORUNDUM resist loading and are easier to use, with far less physical effort. In addition, the new type bonds incorporate exceptional strength. Wheels hold shape longer, resist mechanical shock as well as heat shock, and give maximum safety under the most severe grinding operations.

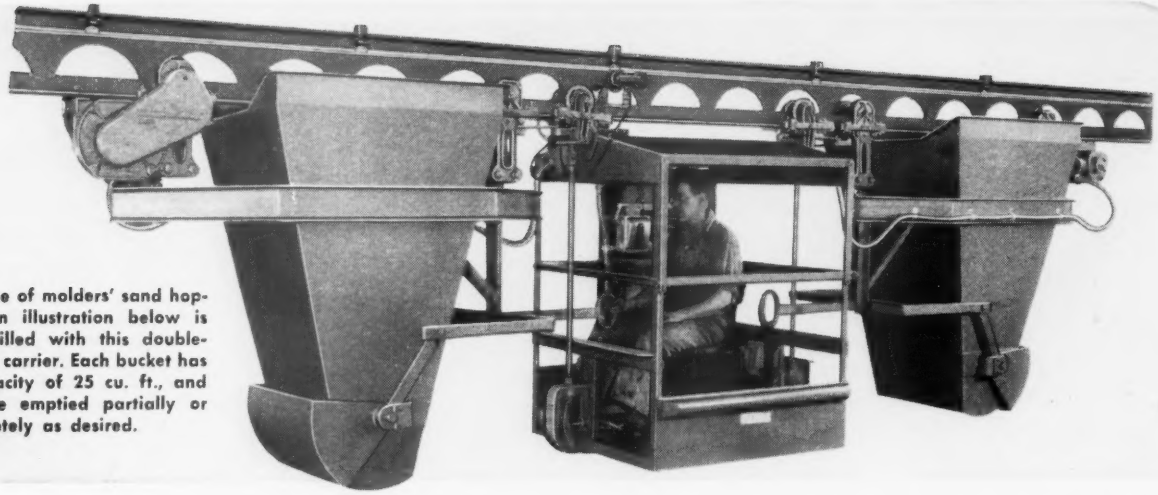
**FOR EVERY ABRASIVE JOB** in your foundry...on castings, forgings, welds...on high and low tensile steels...on non-ferrous metals...and on every type of machine...the proper snagging wheels by CARBORUNDUM can increase your production and cut your costs.

**CARBORUNDUM**

REGISTERED TRADE MARK

*...continually putting more* **SENSE** *in your abrasive* **DOLLAR**

81-510



The line of molders' sand hoppers in illustration below is kept filled with this double-bucket carrier. Each bucket has a capacity of 25 cu. ft., and can be emptied partially or completely as desired.

# Tramrail Bucket Carrier Speeds Sand to Molders

## *Do you have 10 or more molders? Do you produce large castings?*

### Then This Carrier Offers You Important Advantages

If your foundry is of medium or large size, either using a considerable volume of core or molding sand, or requiring sand distribution to a number of points, you should look into the possibilities of a Cleveland Tramrail cab-operated bucket carrier operating on overhead trackage. Consider these advantages:

1. High speed delivery from muller to molders.
2. One Tramrail unit serves many molders.
3. Greatly reduces sand spillage and aids cleanliness.
4. Sand carried in buckets does not lose its moisture content.
5. Easily adapted to foundry layouts of all types. Not confined to straight-line layouts.
6. Long track life is assured because tracks are high carbon with raised wearing treads.
7. Equipment has very few wheels and bearings to require attention.
8. Low overall maintenance.
9. Because of ease of erection or dismantling, Tramrail Systems are easily re-arranged or extended to suit new conditions as they arise.
10. Cost of equipment and operation usually lower than for other mechanized methods.
11. Tried and proven for many years in many foundries.

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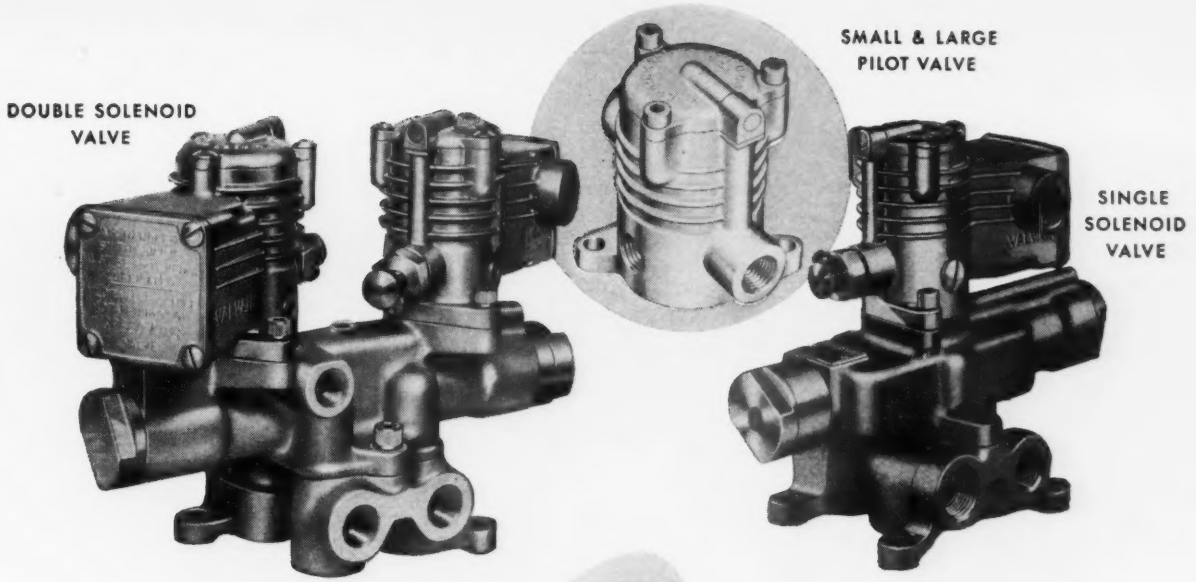
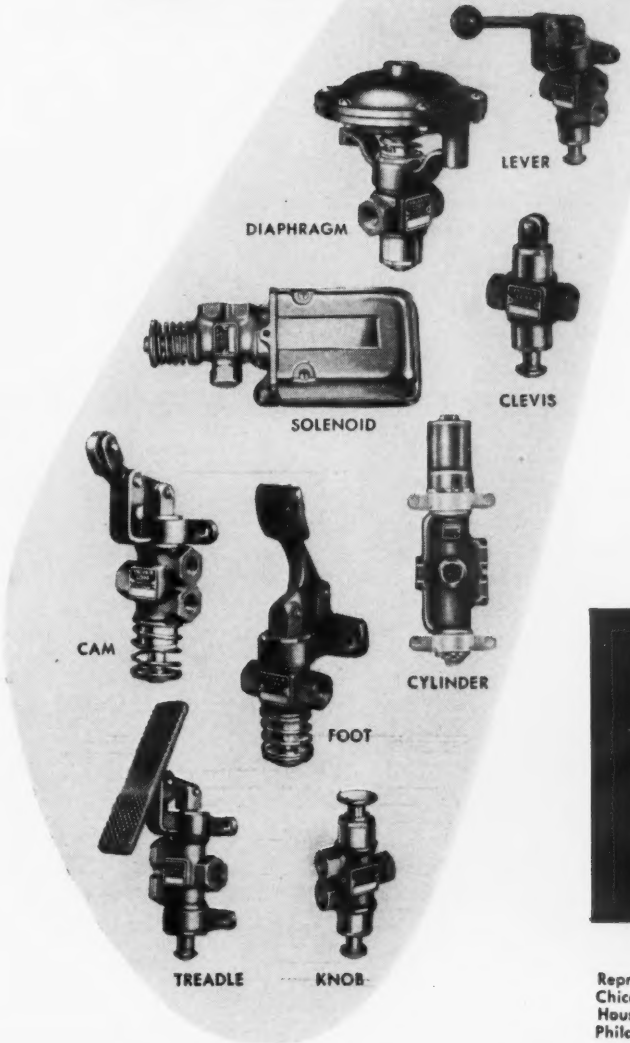
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

**CLEVELAND TRAMRAIL DIVISION**
THE CLEVELAND CRANE & ENGINEERING CO.
3834 East 286th Street Wickliffe, Ohio

**CLEVELAND TRAMRAIL**
**OVERHEAD MATERIALS HANDLING EQUIPMENT**




# AIRMATION BY VALVAIR




AIRMATION by VALVAIR — a control of components for Automation in air, vacuum and hydraulics.

SINGLE OR DOUBLE SOLENOID VALVES, LARGE OR SMALL PILOT VALVES — Designed and built to J. I. C. Standards. Maximum Speed — Life — Range — Durability.

9 DIFFERENT CONTROL ASSEMBLIES with 5 body types and 5 sizes give you thousands of different combinations.

*ASK FOR BULLETIN A14*

**Valvair**

Affiliate: Sinclair-Collins Valve Company

Representation in: Baltimore • Birmingham • Boston • Buffalo • Charleston, W. Va. Chicago • Cleveland • Cranford, N. J. • Dayton • Denver • Detroit • Eureka, Calif. Houston • Kansas City, Mo. • Logansport, Ind. • Louisville • Minneapolis • S. Pasadena Philadelphia • Pittsburgh • Portland • St. Louis • Seattle • San Francisco • Syracuse Montreal • Toronto • Vancouver

## Eye Protection

AO† 305 NFA Foundry Goggle

# **This Old Friend** of Workers and Management has saved many an eye in Foundries

Over the years many workers would now be sightless and many foundries would have had heavy eye accident compensation costs if this goggle had not been on the job protecting the vision of foundrymen. It was developed originally for members of the National Foundry Association but is now generally available. The 305 NFA Goggle is recommended for protection against impact hazards met in such foundry work as melting, pouring, chipping, grinding, babbitting, riveting, hand tool and machine operations. Your nearest AO Safety Products Representative can supply you . . . check with him on safety clothing also.

**QUICK FACTS**

MASK — Soft snug-fitting plastic. Soft sponge rubber edges bound with pliable corduroy. Fits face comfortably while protecting area around eyes. Leather mask available on request.

VENTILATORS — Wire screens around eyecups provide ample ventilation — help keep lenses fog-free. Sparks and flying objects cannot reach eyes.

HEADBAND — One-piece rubber, easily adjustable.

LENSES — 50 mm. Super Armorplate or 6 Curve Super Armorplate clear or Calobar in medium, dark or extra dark shades.

SIZES — 305 Standard for large or medium features. 307 — Same construction but for small features.

† T. M. REG. BY AMERICAN OPTICAL COMPANY

American Optical
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

# DEVIL'S PUTTY

## A GRAPHITE IMPREGNATED PLASTIC

**• • • MAKES REMOVAL OF "SKULLS" EASY**

. . . a new graphite impregnated plastic refractory for: steel and gray iron ladle linings; making up spouts and runners; linings for ferrous and nonferrous metal melting furnaces and similar applications.

DEVIL'S PUTTY reduces refractory inclusions, thus producing cleaner castings; withstands severe thermal shock without "sluffing off"; contains chemically treated graphite that will not burn out of the mix, which adds surface lubrication and permits cleaner and faster pours. Molten metal has no sticking tendency to DEVIL'S PUTTY lining, so, slag rises quickly to top for easy skimming.

# ADAMANT®

FIRE BRICK CEMENT

## NATIONALLY USED FOR BONDING

## STOPPER ROD ASSEMBLIES

ADAMANT is highly satisfactory for bonding Stopper Rod Sleeves and Heads because it produces a strong, tight, permanent bond that insures against penetration of molten metal . . . Try ADAMANT on your tough jobs, like piers, jambs, arches, etc. . . . It really welds the brick together . . . You'll like its smooth working properties too. Available in 100, 250, and 500 lb. air-tight, steel drums.

Beginning to assemble the Stopper Rod. Note the liberal application of ADAMANT to Stopper Rod pin.

# BOTFIELD

## CUPOLA BLOCKS

### SPECIAL MIX

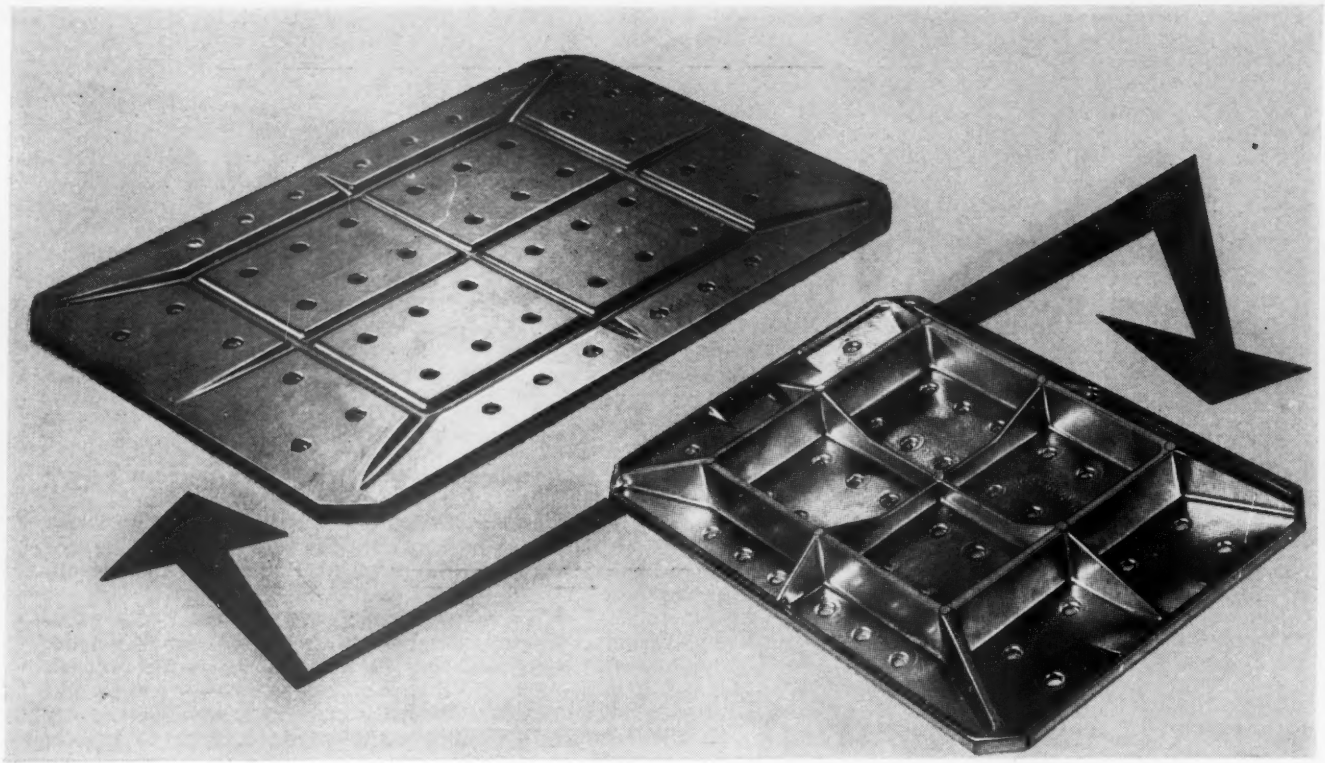
Here are Cupola Blocks of high density to resist slag attack and gas penetration. These blocks will glaze on the surface and thus resist the penetration of molten metal. Pyromatic Cone Equivalent equals 26 (2905° F.)

Write for useful literature . . . and the address of your nearest Botfield Distributor

**BOTFIELD REFRACTORIES CO.**

779 S. Swanson Street, Philadelphia 47, Pa.

In Canada, Canadian Botfield Refractories Co., Ltd. 171 Eastern Avenue, Toronto



# Bottom Board Standardization — and how EDCO "helped"

For years, foundries stocked many sizes of boards. Inventories, even in a small foundry, ran into hundreds of boards. They were wood, metal, steel, iron, sometimes aluminum. The point being they were different—in size, and in construction.

Edco, in conjunction with various foundries across the country, surveyed to determine the most popular size of Bottom Boards in productive use. That was 8 years ago when Edco had 6 board sizes. Today, the standard Edco list includes 83 sizes. Impressive? Yes. But without standardization, the number would be 2, possibly 3 times as great.

Standardization—by Edco and by foundrymen, has resulted in economics throughout the industry by eliminating unnecessary sizes, by meeting the specific needs of all sizes of foundries, regardless of the type of casting done.

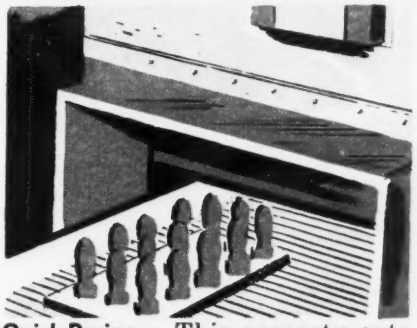
Next time you need safe, permanent Bottom Board equipment, consider Edco Dowmetal Bottom Boards—simply write us or phone MAnsfield 6-7330 and we'll send you a price schedule and list of 83 standard sizes available from stock.

**CHRISTIANSEN CORPORATION**

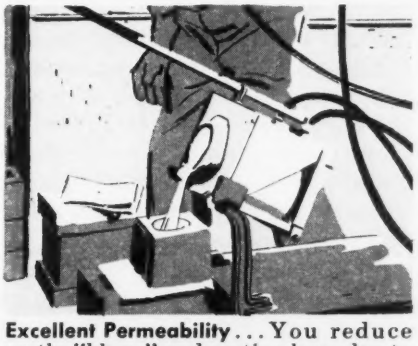
210 SOUTH MARION STREET • OAK PARK 1 (Chicago Suburb), ILLINOIS

EDCO DOWMETAL BOTTOM BOARDS • EDCO ALUMINUM INGOT

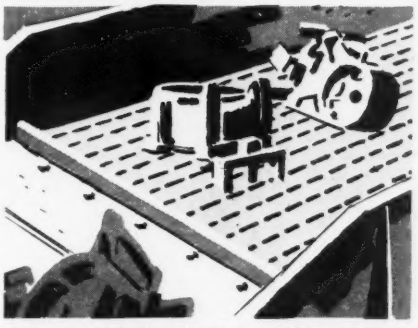
**Superior Green Strength**... Mogul-bonded cores maintain shape and dimension throughout handling and storage.



**Quick Drying**... This property cuts down oven time, thus increasing oven capacity.



**Excellent Permeability**... You reduce costly "blows" and casting loses due to inadequate venting.



**Adequate Collapsibility**... Mogul burns out at just the proper instant, eliminating strains and hot-tears.

# Why you get greater green strength with MOGUL® cereal binder

Specially developed to meet today's needs for greater efficiency. Mogul Corn Cereal Binders are unique in the industry. Carefully controlled, modern wet-milling processes produce a uniform product. Because of its bonding power in the wet state, Mogul Binder yields a core of great sag resistance and dimensional stability.

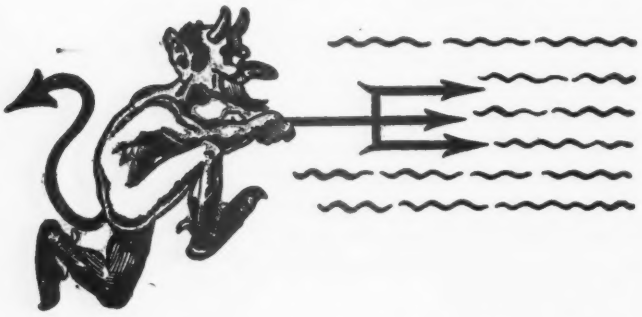
Cores made with Mogul Binder produce castings with a finer finish and exceedingly true pattern reproduction.

## Free Technical Service

Our technical service staff welcomes an opportunity to help you solve actual production problems. Our complete modern facilities are at your service.

**CORN PRODUCTS REFINING COMPANY**
17 Battery Place, New York 4, N. Y.

# Produce More Castings Per Heat with



# Soffel's THERMOTOMIC® "HOTOP" LIQUIDIZER

**Exothermic Carbon Free Liquidizer For Iron, Steel, Nodular Iron**

***This new head compound saves feeding metal in risers or feeding heads which can now be reduced in height 40 to 70%***

SOFFEL'S THERMOTOMIC "HOTOP" CARBON FREE LIQUIDIZER is different from other head compounds in that "HOTOP" LIQUIDIZER does NOT contain powdered metal, is NOT a thermit compound. It is a patented exothermic compound entirely free of carbon, sulfur and phosphorus and can be used without danger of contamination on any ferrous metal or alloy.

"HOTOP" LIQUIDIZER also saves molding time as less sand is needed in the mold cope due to short height of risers. "HOTOP" LIQUIDIZER produces a liquid slag well over 4000° F. of heat and insulates the metal. The feeding metal will remain liquid at least 50% longer assuring adequate feeding while the casting cools and solidifies. Piping and shrink cavities caused by premature freezing of the feeding metal are eliminated.

***THERMOTOMIC HOTOP LIQUIDIZER BRAND "B" SHOULD BE USED ON RISERS UNDER 4 INCHES IN DIAMETER***

***GUARANTEED TO PRODUCE SOLID CLEAN CASTINGS***

## SOFFEL'S FAMOUS *Carbon Free* LIQUIDIZER FOR ALL METALS and ALLOYS

***SOFFEL'S EXOTHERMIC CARBON FREE LIQUIDIZER is the leader in major foundries for use on both ferrous and non-ferrous metals and also in ingot production. It is the original scientific non-carbon, exothermic compound for feeding heads and risers.***

When applied on the heads or risers, CARBON FREE LIQUIDIZER reacts within itself exothermically, producing a temperature above 3200° F. It actually increases the temperature of the feeding metal to a point well above that of the metal in the main body of the casting, thus ensuring that the feeding metal will be the last to freeze. In this manner, shrink cavities in the casting caused by premature freezing of the feeding heads will be eliminated. After the exothermic action has ceased, the LIQUIDIZER forms a soft refractory insulating blanket on the metal. This confines the heat generated by the LIQUIDIZER and aids in maintaining the desired high temperature of the feeding metal in the heads or risers.

## SOFFEL'S THERMOTOMIC COMPOUND

PATENTED

## FOR ALL METALS and ALLOYS

THERMOTOMIC COMPOUND is a patented Exothermic compound that can be molded into any desired shapes and used as feeding ring inserts under risers or as facing application where it is desired to maintain fluidity of the casting metal. THERMOTOMIC permits reversal of the trend towards large feeding heads and risers, making it possible to use heads that are shorter and more compact with 1½" feeder openings.

This permits easy removal of the casting feeding heads and sharp reductions in cleaning and finishing costs. When THERMOTOMIC is used as inserts or as facing mixing with molding sand in the mold, heat at thin metal sections is retained until the thick main body of the casting has solidified, thus eliminating shrink cracks and improving grain structure and tensile strength. For use in green sand molds, use THERMOTOMIC W. P. (Waterproofed)

*NOTE: SOFFEL'S CARBON FREE LIQUIDIZER NO. 5 is recommended for use on top of feeding heads in conjunction with THERMOTOMIC COMPOUND. For aluminum castings, use THERMOTOMIC ABC and AL-X31 LIQUIDIZER. When ordering a trial sample, advise the kind of metal to be used on.*

U. S. Patents No. 2,490,327 and No. 2,500,097

## PITTSBURGH METALS PURIFYING COMPANY

**1352 MARVISTA ST., N. S. PITTSBURGH 12, PA.**

**WORLD'S LARGEST MANUFACTURER OF FLUXES AND PURIFIERS FOR ALL METALS AND ALLOYS**

# Pangborn Rotoblast® gives you

# lower cleaning costs per ton!

Pangborn Rotoblast gives you lower cost per ton of castings cleaned because it cuts working time, does a thorough cleaning job quickly. *Lower cost* because you save on labor . . . because Rotoblast requires less power to operate. Whether your requirements call for one of the machines shown here —a Pangborn Blastmaster, Table-Room, or Continuous-Flo Barrel—or one of the other machines in the Pangborn line, Pangborn Rotoblast can save you money! See for yourself—write for Bulletin 214 to: PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Maryland. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

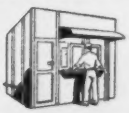
*U. S. Pat. #2184926 (other patents pending)

# Pangborn

## BLAST CLEANS CHEAPER

Rotoblast Blastmaster® & Continuous-Flo Barrel

Rotoblast Tables & Table-Rooms



Special Blast Rooms & Cabinets

Pangborn Dust Control Equipment

Malleabrasive* Shot & Grit

# What you can expect from "SW" Cupola Collector operation!

## TESTS ON "SW" CUPOLA COLLECTOR OPERATION*

**CUPOLA OPERATING DATA**

| | |
|---|---|
| Cupola Size | #8 Whiting |
| Shell Dia. at Melt Zone | 78 inches |
| Shell Dia. at Top | 78 inches |
| I. D. Lining—Melt Zone | 53 inches |
| Average Daily Melt | 7 hours—50 tons |
| Average Melt Rate | 7.5 tons/hr. |
| Iron—Coke Ratio | 7 to 1 |
| Blast Air | 3,200—4,750 CFM |
| Area of Charging Door | 50 square feet |

*Location of test installation on request.

**OPERATING PERIOD**

| TEST NO. | DURATION | AIR BLAST | EFFLUENT DUST CONCENTRATION |
|---|---|---|---|
| 1 | 40 Minutes | 3,600 CFM | 0.42# per 1,000# Exhaust |
| 2 | 40 Minutes | 4,500 CFM | 0.33# per 1,000# Exhaust |
| 3 | 30 Minutes | 3,500 CFM | 0.43# per 1,000# Exhaust |
| 5 | 31 Minutes | 3,800 CFM | 0.40# per 1,000# Exhaust |
| 6 | 30 Minutes | 4,500 CFM | 0.56# per 1,000# Exhaust |
| 8 | 13 Minutes | 3,900 CFM | 0.39# per 1,000# Exhaust |
| 9 | 30 Minutes | — | 0.41# per 1,000# Exhaust |
| 10 | 30 Minutes | 3,500 CFM | 0.48# per 1,000# Exhaust |
| | | | **Av. 0.43# per 1,000# Exhaust** |

**RUN DOWN PERIOD**

| | | | |
|---|---|---|---|
| 4 | 30 Minutes | 4,750 CFM | 0.66# per 1,000# Exhaust |
| 7 | 32 Minutes | — | 0.72# per 1,000# Exhaust |

You, too, can expect the performance from Schneible Cupola Collectors that is shown in the tests above, made recently at an eastern foundry.

What this performance means to you is money saved on plant clean-up costs and replacement of expensive roofs, sash, gutters and other facilities corroded by fly-ash and cinders. This saving alone can more than return the investment in "SW" Cupola Collectors.

Improved working conditions, employee relations, and community good will are other tangible benefits from cleaner, purer air around your plant.

Schneible builds for permanence and lowest upkeep costs. Simplicity of design assures minimum attention. The many patented money-saving features are found only in Schneible "SW" Cupola Collectors.

Take a dust count of your plant or, better still, get a recommendation from the local Schneible representative.

Our Bulletin No. 554 containing diagrams and other pertinent information is yours for the asking.

**CLAUDE B. SCHNEIBLE COMPANY**
**P. O. Box 81, North End Station • Detroit 2, Michigan**

Cable Address: CBSCO
European Licensee: Elex S. A., Zurich, Switzerland

**SCHNEIBLE**

# LATE NEWS

MARCH 28 1955

**TURBINE ENGINES:** It's no secret that many automotive companies are working on turbine engines. But publicity department releases state that use of turbines in trucks, buses or passenger cars won't come for 10 to 15 years. Engineers working on turbine engine development in and out of automotive companies, however, say that it will be within 5 years. They maintain that many of the engineering and production problems until recently set up as obstacles to early use of the engines in automotive vehicles have been licked.

Fuel consumption has been reduced to about 15 miles per gallon. Exhaust heat is lower than that for piston engines. New alloys containing not-too-critical metals capable of withstanding high temperatures in turbine engines have been developed. Turbine wheels have been cast in one piece, reducing the cost of wheels fabricated from individual wheel buckets. Furthermore, the engineers say that turbine engine-powered trucks now are carrying pay loads and experimental buses and passenger cars are operating on city streets.

Importance of the whole thing is in the effect replacement of piston engines by turbines will have on the foundry industry. Different metals will be used. More parts will be cast by precision molding methods. Heat treating problems will change. Emphasis will be placed on different types of foundry production equipment. Naturally the change won't take place overnight, but will be gradual.

**CASTING CLINICS:** One-day casting clinics are being held throughout the country by Federated Metals Division, American Smelting & Refining Co., New York. The next one is Apr. 13 at University of Rochester, Rochester, N. Y. R. A. Colton and D. L. LaVelle, authorities on brass and aluminum foundry procedures, will lead discussions on choice of alloys, melting, gating, risering, pouring, analysis of defects, and gases in metals.

**FEMA MEETING:** Foundry Equipment Manufacturers Association is holding its first spring meeting at Sheraton-Carlton Hotel, Washington, on Apr. 15. Separate product group sessions will be held in the morning. These will cover blast cleaning and tumbling equipment; dust and fume control equipment; flasks, jackets and accessories; furnaces and accessories; material handling equipment, and molding and coremaking machines.

The dust and fume control group is having a special program including a talk on "Tailoring the Air Pollution Ordinance to the Needs of the Community," by Arthur C. Stern, chief, Air Pollution Control Program; U. S. Public Health Service; Dept. of Health, Education and Welfare; Cincinnati. Theodore F. Hatch, professor, Industrial Health Engineering, University of Pittsburgh, will discuss "The Dust Control Engineer and the Process Designer Should Work Closer Together." Einar A. Borch, chairman, FEMA Statistical Committee, will give an "Interpretation of Dust and Fume Control Statistics."

All groups will join in the afternoon to hear two papers: "Statesmanship in Government-Industry Relations," by Charles W. Stewart, executive vice president, Machinery and Allied Products Institute, Washington, and the "The Case for Castings," by Ross L. Gilmore, president, Superior Steel & Malleable Castings Co., Benton Harbor, Mich.

**CAST CRANKSHAFTS:** One General Motors Corp. automotive division is converting forged crankshaft production into shell molding. By June 15, 25 per cent of the cranks will be shell-cast in pearlitic malleable iron. Casting of all that division's crankshafts is expected by the end of the year.

**CASTINGS SECTION CHIEF:** Glenn R. Hughes, assistant sales manager, Ohio Steel Foundry Co., Springfield, O., has been appointed chief of the Castings Section, Iron and Steel Division, Business and Defense Services Administration, Washington. He succeeds Paul W. Vandenberg, who will resume his duties as manager of equipment manufacturers' sales for Crane Co., Chicago. It is reported that one of the early jobs on Mr. Hughes agenda will be to call in the Heavy Steel Casting Task Groups for discussion to determine if a deficit exists in capacity to produce heavy steel castings for all-out mobilization.

**MFS MARKET CONFERENCE:** The program at the Malleable Founders' Society market development conference, Apr. 7-8, at the Edgewater Beach Hotel, Chicago includes the following talks: "Selling Techniques," by Thomas W. Dow, Dow Chemical Co., Midland, Mich.; "What We Expect from Our Suppliers," by Thomas Logan, Caterpillar Tractor Co., Peoria, Ill.; "Selection of Materials," by R. H. Marshall, Frank G. Hough Co., Libertyville, Ill.; and "A Look into the Crystal Ball of 1975," by Glenn W. Merrifield, Giffels & Vallet Inc., Detroit. Din-

ner speaker on Apr. 7 will be Will A. Foster, Borden Co., who will discuss "Opportunity Is Knocking for Salesmen." The Belle City Malleable Iron Co. glee club will entertain at the dinner on Apr. 8.

**GRAY IRON ACTIVITY:** According to the monthly statistical service of the Gray Iron Founders' Society, the operating rate of the industry increased from a low of 42 per cent in July, 1954, to 76.7 per cent in January, 1955. The rate in January, 1954, was 63.5. Preliminary statistics point to a further increase. The base period for determining the operating rate of the industry is production for the first six months of 1951.

**ICI WILL MEET:** The spring meeting of the Investment Casting Institute has been set for May 4-6 at the Park Sheraton Hotel, New York. The meeting has been lengthened to three days to give members more time for discussion. Wednesday, May 4, will be devoted to technical committee meetings and a directors meeting. On Thursday, May 5, the regular ICI technical meeting will be held, and the institute's business meeting is scheduled for Friday, May 6. Topics to be discussed at the Thursday technical meeting include "Recommended Melting Practices for Small Heats"; "Theory and Practice of Gating, Risering and Spruing"; and "Application of Vacuum Melting to the Investment Casting Industry." Luncheons are scheduled for each day of the meeting.

**MAGNESIUM PRICES:** Dow Chemical Co. announced price increases effective Mar. 21 of 1 cent per pound for AZ91B die casting ingot and 1½ cents for primary magnesium and alloy ingot.

**PERSONALS:** Bernard N. Ames, previously general manager, Doran Manganese Bronze Co., Brooklyn, N. Y., a subsidiary of Columbian Bronze Corp., Freeport, L. I., N. Y., has been made vice president of Columbian . . . Harry J. Hemingway, former president and director, American Marietta Co., Chicago, has been elected president, Advance Aluminum Castings Corp., Chicago, filling the vacancy created by the death of Roy W. Wilson on Nov. 29 . . . Otto A. Pfaff, president and general manager, American Wheelabrator & Equipment Corp., Mishawaka, Ind., recently was elected to the board of directors of Bell Aircraft Corp., Buffalo . . . Gordon P. Street, president, The Wheland Co., Chattanooga, Tenn., has been elected a director of The Cincinnati, New Orleans & Texas Pacific Railway Co., one of the lines in the Southern Railway System.

# PRICES OF FOUNDRY METALS AND COKE

(As of Mar. 28, 1955)

## FOUNDRY COKE

(Per net ton, f.o.b. ovens)

| | |
|---|---|
| **BEEHIVE** | |
| Connellsville | $16.50-17.00 |
| **OVEN** | |
| Birmingham | $22.65 |
| Buffalo | 25.00 |
| Chicago | 24.50 |
| Detroit | 25.50 |
| Erie, Pa. | 25.00 |
| Everett, Mass. | 23.50 |
| Indianapolis | 24.25 |
| Kearny, N. J. | 24.00 |
| Lone Star, Tex. | 18.50 |
| Milwaukee | 25.25 |
| Montreal, Que. | 26.25 |
| Painesville, O. | 25.50 |
| Philadelphia | 23.00 |
| Portsmouth, O. | 24.00 |
| St. Louis, del. | 26.00 |
| St. Paul | 23.75 |
| Swedeland, Pa. | 23.00 |
| Terre Haute, Ind. | 24.05 |

## PIG IRON

(Per gross ton f.o.b. furnace)

| | No. 2 Foundry | Malleable |
|---|---|---|
| Bethlehem, Pa. | $58.50 | $59.00 |
| Birmingham | 52.88 | .... |
| Buffalo | 56.50 | 57.00 |
| Chicago | 56.50 | 56.50 |
| Cleveland | 56.50 | 56.50 |
| Duluth | 56.50 | 56.50 |
| Erie, Pa. | 56.50 | 56.50 |
| Everett, Mass. | 61.00 | 61.50 |
| Fontana, Calif. | 62.50 | .... |
| Geneva, Utah | 56.50 | .... |
| Granite City, Ill. | 58.40 | 58.90 |
| Lone Star, Tex. | 52.50 | 52.50 |
| Neville Island (Pittsburgh) | 56.50 | 56.50 |
| Steelton, Pa. | 58.50 | 59.00 |
| Swedeland, Pa. | 58.50 | 59.00 |
| Toledo, O. | 56.50 | 56.50 |
| Troy, N. Y. | 58.50 | 59.00 |
| Youngstown, O. | .... | 58.50 |

## NONFERROUS INGOT

(Cents per pound, carlots)

**BRASS AND BRONZE:** Red brass, No. 115, 34.00; tin bronze, No. 225, 45.50; No. 245, 39.25; high-leaded tin bronze, No. 305, 38.00; No. 1 yellow, No. 405, 29.75; manganese bronze, No. 421, 32.25.

**ALUMINUM:** 99 per cent plus, primary ingots 23.20, secondary No. 12 alloy 29.25-30.50. Deoxidizing grades: No. 1 30.75-32.50; No. 4 28.75-29.50.

**MAGNESIUM:** 99.8 per cent notched ingots 29.25, f.o.b. Freeport, Tex. (10,000 lb or more).

**COPPER:** Electrolytic 33.00, delivered Connecticut valley.

**ZINC:** High grade 12.85, delivered. Die casting alloy 15.50, delivered.

## IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

| | No. 1 Heavy Melting Steel | No. 1 Cupola Cast | Heavy Breakable Cast | Clean Auto Cast | Machinery Cast | Malleable | Short Steel Rails |
|---|---|---|---|---|---|---|---|
| Birmingham | $32.00-33.00 | $45.00-46.00 | ..... | ..... | ..... | ..... | $43.50-44.50 |
| Boston* | **29.50-30.00 | **30.00-31.00 | ..... | ..... | **33.00-34.00 | ..... | ..... |
| Buffalo | 32.00-33.00 | **37.00-38.00 | ..... | ..... | **42.00-43.00 | ..... | 42.00-43.00 |
| Chicago | 35.00-37.00 | 39.00-41.00 | ..... | 46.00-47.00 | 46.00-47.00 | 44.00-45.00 | 47.00-49.00 |
| Cincinnati* | **33.00-34.00 | **39.00-40.00 | **35.00 | ..... | **44.00-45.00 | ..... | 47.00-48.00 |
| Cleveland | 34.00-36.00 | 45.00-46.00 | 34.00-35.00 | 46.00-47.00 | 46.00-47.00 | 45.00-46.00 | 50.00-52.00 |
| Detroit* | **25.50 | **34.00 | **25.00 | **38.00 | ..... | **30.00 | ..... |
| Los Angeles | 28.00 | **42.00-44.00 | ..... | ..... | ..... | ..... | ..... |
| New York* | 32.50-33.00 | 30.00-31.00 | 31.00-32.00 | ..... | ..... | ..... | ..... |
| Philadelphia | 38.50-39.00 | 38.00 | 39.00 | ..... | 44.00 | 44.00 | ..... |
| Pittsburgh | 38.00-39.00 | 38.00-39.00 | 32.00-33.00 | ..... | 43.00-44.00 | ..... | 50.00-52.00 |
| St. Louis* | 31.00 | 40.00 | 32.50 | 42.50 | ..... | ..... | 46.00 |
| San Francisco | 27.00 | 40.00 | 36.00 | 39.00 | 48.00 | ..... | ..... |
| Seattle | 31.00 | **35.00-38.00 | 23.00 | ..... | ..... | ..... | ..... |

*Brokers' buying prices. **F.o.b. shipping point.

# Why Do Foundries Use Over 200,000 Tons of *Lyquaface Sand Every Month?

You may profit by looking into the phenomenal growth of Lyquaface as a sand coating. Foundrymen welcome its superior qualities: Lyquaface is quickly and evenly distributed as a coating on the sand grains. Thus, it tends to increase permeability and produce castings of better quality and finish with *any* sand used. Since Lyquaface does not absorb moisture, lower moisture levels are afforded. Because it does not contain any light volatiles, Lyquaface generates far less gas. At the same time it is 3 to 4 times as effective by weight.

***YOU MAY EXPECT THESE ADVANTAGES:***

1. Improves quality of casting and finish.
2. Reduces casting weight.
3. Saves grinding, shot blasting, cleaning time.
4. Eliminates waste in handling.
5. Reduces losses.
6. Minimizes dust hazard.
7. Less parting is required.
8. Same grade of sand can be used for wide range of castings.
9. Increases flowability of metal.
10. Molds weigh less, improving production.
11. Gates and sprues can be remelted without cleaning.
12. Reduces need for gaggers, nails, and bars to a minimum.

*Trade Mark Reg.

*Ask for Literature*

**Whitehead Brothers COMPANY**

Established 1841

**NEW YORK OFFICE**
324 West 23rd St., New York 11, N. Y.

**NEW ENGLAND OFFICE**
17 Exchange Place, Providence 1, R. I.

***Manufacturers of:***

**LYQUAGRIP**
Ready-to-use core paste

**DOB-IT**
Ready-to-use core mudding compound

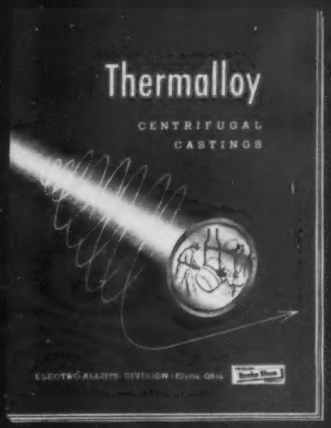
**JOINT-SEAL**
Plastic compound for perfect sealing

**LYQUAFLOUR**
For cleaner surface, better shakeout

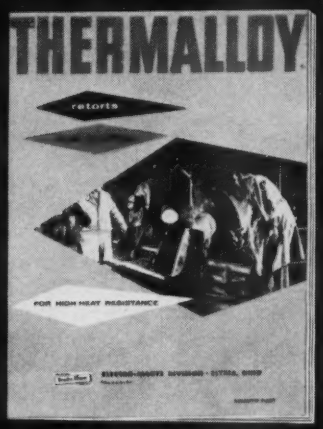
*Here's help in Ordering*

# THERMALLOY*

## heat-resistant castings



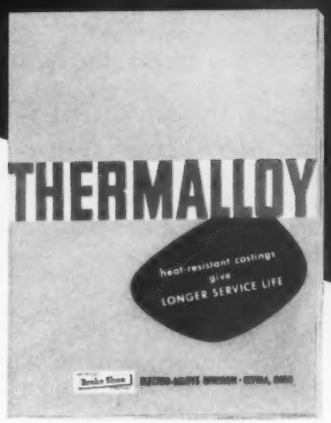

Centrifugal
Castings Bulletin




Muffles & Retorts
Bulletin T-239

Heat Treat Trays & Fixtures
Bulletin T-227

Heat Treat Pots
Bulletin T-234




General Thermalloy
Catalog T-225

Conveyor Belt
Bulletin T-241

Wherever high heat and special atmospheres are problems in heat-treating or processing equipment, Thermalloy heat-resistant castings can help to minimize expensive repairs, high maintenance costs, sudden breakdowns.

To help you in ordering Thermalloy heat-resistant castings for use in many different types of equipment, you will find assistance in these bulletins. To obtain the bulletins pertaining to your problem, call your nearest Electro-Alloys representative or write Electro-Alloys Division, 6005 Taylor St., Elyria, Ohio.

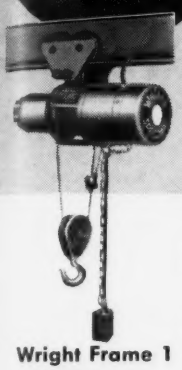
AMERICAN Brake Shoe COMPANY

**ELECTRO-ALLOYS DIVISION**
**Elyria, Ohio**

*Reg. U. S. Pat. Off.

ACCO products

# Why WRIGHT *Speedway* Hoists Merit Full Confidence of Both Production and Maintenance Men

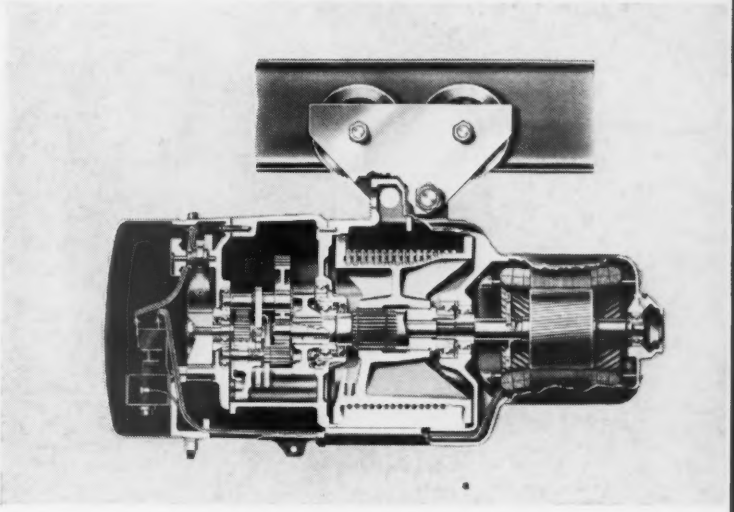


Wright Frame 1 Speedway ¼ to 1-ton

## It's a heavy-duty workhorse for Production Men...

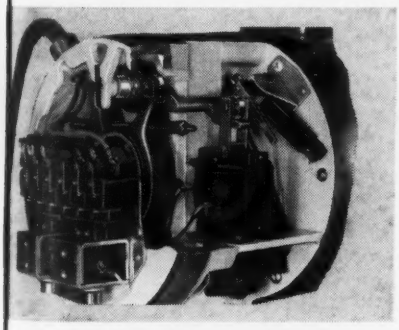
because of sound, generous and practical design of all components, plus standard NEMA specification totally enclosed motors. Heavy-duty design and fine balance give users definite assurance that 1954 Model WRIGHT *Speedway* Frame 1 Hoists will handle tough jobs on any duty cycle for which 1½ H.P., 30-minute NEMA motors are satisfactory. We guarantee this.

A New Booklet, #**DH-133B,** tells the full story of the many fully-tested structural, electrical and mechanical features that make WRIGHT Frame 1 *Speedways* ideal for production materials handling work. Write our York, Pa., office for your copy of this book that is pictured below.

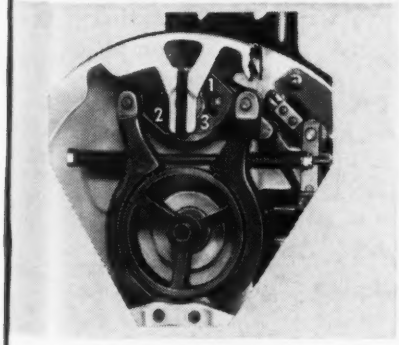


The ideal hoist for production work

## It's the easiest hoist for Maintenance Men to service...



Easiest to get at




Nothing to adjust but the cam!

because those components that are most likely to need service or adjustment—on any hoist—are fully accessible when the end housing and side cover are removed as shown in the picture at the left. Removal of housing and cover is a simple matter of loosening or removing a few screws.

To compensate for brake lining wear on the motor brake on these 1954 Model WRIGHT *Speedways*, there is nothing to adjust but the cam. This adjustment is literally "as simple as ABC." Cam settings are pre-determined and numbered. There is no guess work. The long, calibrated compression springs and the solenoid are factory-set... they NEVER need adjustment for brake lining wear.

### Write for this New Booklet

Write our York, Pa., office for this New Booklet, #DH 133B. It gives complete information on the 1954 Model WRIGHT *Speedway* Electric Hoists, Frame 1 and 1½ (500 to 4000 lb. capacities). The booklet fully describes the many electrical, mechanical and structural features that make these WRIGHT Hoists ideal for production and maintenance men.

ACCO

TRADE MARK

**Wright Hoist Division**
**AMERICAN CHAIN & CABLE**

York, Pa., Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

**Hoists Trolleys Cranes**

# THREE NEW TIMKEN® BEARINGS COST LESS THAN PREVIOUS BEARINGS OF SAME BORE SIZES

## *New capacity-packed bearings take up less space, save weight*

THREE new Timken® tapered roller bearings are now available in bore sizes of ¾", 1¼" and 1⅜". They cost less because they are substantially reduced in width and outside diameter compared to previous designs.

Because they take up less space, the new Timken bearings permit savings in related parts, too. And no other bearings have ever delivered so much capacity in so little space.

The new bearings offer two big opportunities to bearing users:

1) Savings through redesign of present tapered roller bearing applications and 2) advantages of Timken tapered roller bearings for new applications, at minimum cost.

In less than a year, over 1,000,000 of these new bearings have already proven themselves in automobile front wheels and other applications.

Why not re-examine your bearing applications today to see where the new Timken bearings can cut your costs or improve your product's quality, or both? Bearings and auxiliary parts are now available. For complete information, write: The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable: "TIMROSCO".

**TIMKEN**® ... your number 1 bearing **VALUE**

TRADE-MARK REG. U. S. PAT. OFF

*TAPERED ROLLER BEARINGS*

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ▯ AND THRUST ▯ LOADS OR ANY COMBINATION ✳

# SPEED CASTING OPERATIONS WITH THIS THERMAL LADLE HEATING BURNER

## MANY COST-SAVING APPLICATIONS...

The extreme high heat release rate of the THERMAL burner makes possible the application of this ladle heating installation without altering your existing facilities or production methods.

1. Reduces ladle pre-heating time as much as 75%.

2. Maintains pouring temperatures during continuous casting operations.

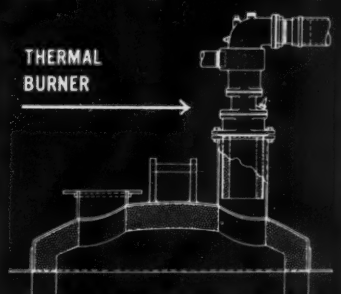
3. Can pre-heat or even melt-down a charge within the ladle.

4. Atmosphere can be controlled as needed.

5. High velocity can actually stir the molten metal.

## QUICK, ECONOMICAL INSTALLATION...

THERMAL ladle heating installations are available complete with ladle covers or ready for mounting to your present cover. All necessary valves, blower, pump, etc., are supplied for immediate application.




**SIMPLE, RUGGED CONSTRUCTION**

The THERMAL High Velocity Burner (for gas or oil) is fired through a small opening in the ladle cover. High velocity insures distribution of heat throughout the ladle.

OTHER THERMAL PRODUCTS & SERVICES

Gas, Oil & Combination Gas-Oil Burners • Heat Exchangers • Air Heaters • Submerged Combustion • Combustion & Heat Transfer Engineering

# THERMAL

**Thermal Research & Engineering Corp.**

CONSHOHOCKEN • PENNSYLVANIA

# ...let's take a look at the 3F SIMPSON *MIX-MULLER* from the OPERATOR'S viewpoint

▶ *Put yourself on the mixer operator's platform . . .* and take a good look at the big-capacity 3F Simpson Mix-Muller from *his* viewpoint. He's interested in producing *big batches of uniformly high quality sand with a minimum of operating and maintenance attention.*

. . . And that's just what he gets with the 3F Simpson Mix-Muller. Specifically, here are some of the reasons why operators prefer Simpsons:

*Easy access for adjustments and safe, routine maintenance* . . . Vertical and radial plow adjustment easily made without entering mixer. Removable crib section permits all rotating machinery to be disassembled without disturbing foundation or overhead structures . . . and parts are removed in units without exposing gears or bearings.

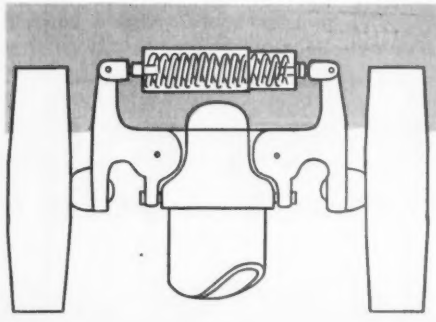
*Safe, positive lubrication* . . . Mullers and turret are grease-packed at the factory, and equipped with both labyrinth and friction type seals. Simple, dependable alemite centralized lubrication system serves mullers, rocker arm and turret—easily accessible from outside of mixer. Reducer is self-contained, splash lubricated.

*Efficient utilization of power* . . . Weight of the sand is carried on the bedplate, and discharge is handled by gravity through bottom doors—the only power required is that used to travel mullers over the sand and repile it in the muller path.

*Most thorough mulling action ever developed* . . . The comparatively lighter, *adjustable* mullers greatly increase the over-all efficiency of the mulling action, as the pressure can be adapted to the type of sand to be conditioned—and the 3F design permits handling at least 1/3 more capacity than previous models.

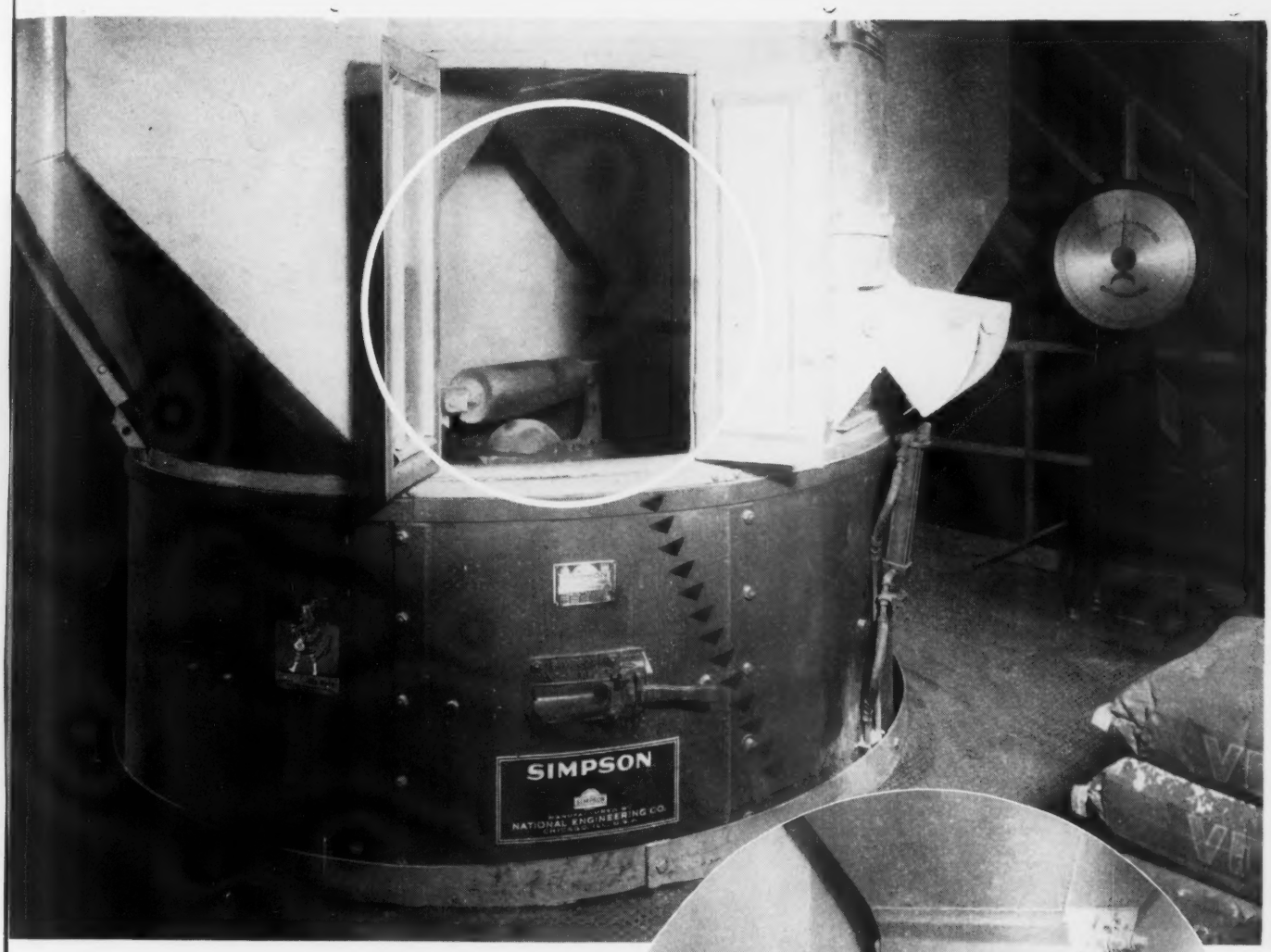
▶ Now, having examined the 3F Simpson Mix-Muller from the operator's platform, we think you can more readily see why these efficient units will give you greater tonnages of properly prepared sand . . . at lower operating and maintenance costs . . . and with fewer rejects, less scrap loss, and over-all improvement in casting quality.

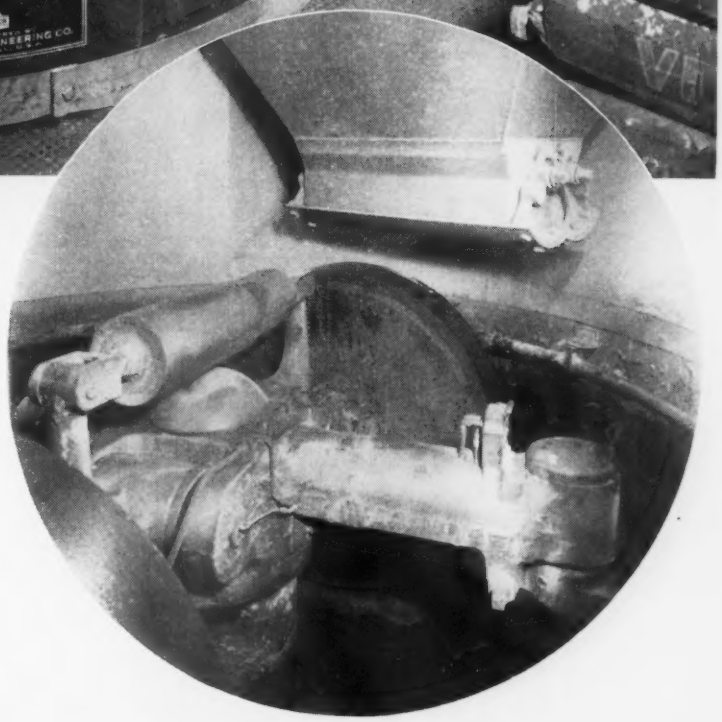
*There is an F Series Mix-Muller for every batch capacity requirement: 50 • 250 • 500 • 1000 • 2000 and 4000 lbs. Your size is included. Write for details today!*



## Advantages of SPRING-LOADED MULLERS . . .

◀▶ The spring loading arrangement of the mullers in the 3F Mix-Muller permits infinitely variable loading from 1,600 to 4,000 lbs. In the beginning of the mixing cycle the sand has little green strength and demands a light mulling weight. As the strength of the sand increases, the mullers rise and in turn exert a higher pressure on the deep sand bed beneath them. Because of the muller suspension and the plow design, the sand is subjected to much more violent agitation, and is considerably increased in volume. The agglomerate grains are broken up, any tendency to form "muller cake" is reduced, and a fluffy sand of high flowability results.



*Here's the way the operator views the 3F Simpson Mix-Muller—in this case, at a large malleable foundry, where this high capacity unit is equipped with air-operated bond hopper and dust hood, charged from overhead batch hopper. The close-up view shows the streamline, dirt-tight design of the turret, spring-loaded mullers and rocker arm assembly, and part of the centralized lubrication system lines.*

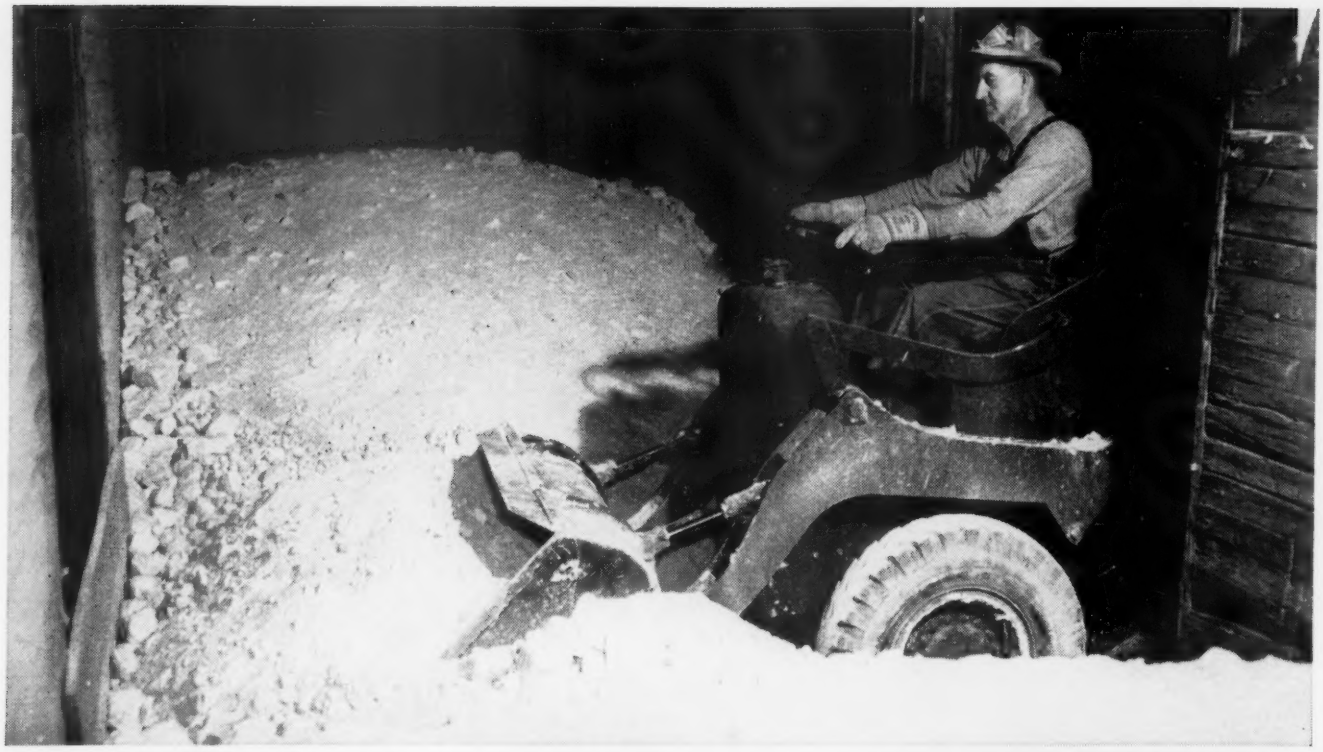
**SIMPSON** *Intensive* **MIX-MULLERS**

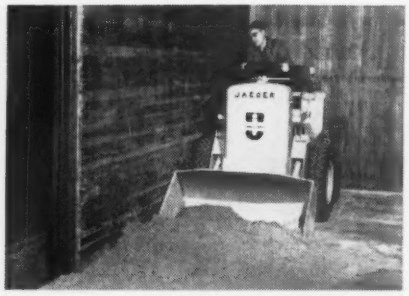
*National Engineering Company*

646 Machinery Hall Bldg. • Chicago 6, Illinois

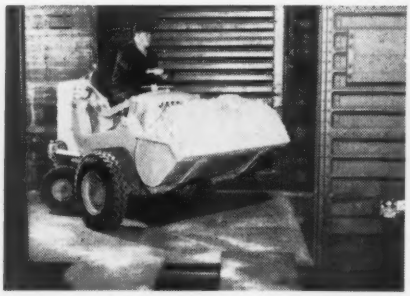
**PRODUCTS OF THE PRACTICAL FOUNDRYMAN**

**NATIONAL SAND AND MOLD HANDLING SYSTEMS • NATIONAL SAND RECOVERY SYSTEM • NATIONAL HYDRO-FILTER • SIMPSON MIX-MULLERS**





Wider bucket. Works flush against walls and into corners for clean pick-up, with substantial savings in hand labor.



Speeds handling because it is easier to maneuver in plant, yard, box car or gondola. Facilitates work in tight places.

Low-level bucket tilt-back permits full bucket loading, lower carrying. Improves stability, enables operator to move at higher speeds.

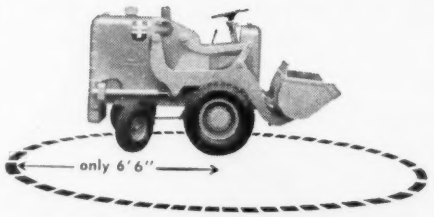
# Fast-handling Auto-Scoop speeds unloading of box cars

The 12 cu. ft. Auto-Scoop you see above is working as a car unloader at American Cyanamid's Company's Piney River, Virginia plant, unloading cars of corrosive sulphur and/or copperas and transporting the material approximately 300 ft. to stockpiles.

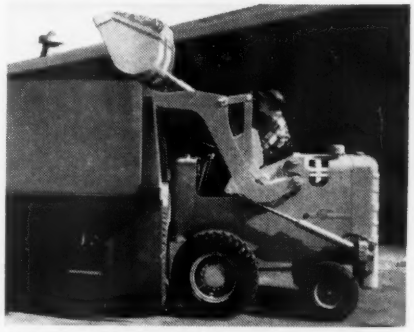
The Jaeger Auto-Scoop is ideal for this type of work, being designed to operate in narrow spaces and cramped quarters, and to carry full loads to 1200 lbs. Rear steering wheels turn in only 6'6" radius with bucket in carry position (5" shorter than other scoop loaders). Faster speeds (to 13.88 mph in reverse, 7.66 forward) cut maneuvering and travel time. Independent forward-reverse control permits instant changes in travel direction. 55" bucket lip and full 45° bucket angle when in dumping position (both greater than other loaders) insure faster, cleaner discharge.

Independent power tilt-back enables the operator to move into material and retract bucket before hoisting, insures a full load, makes possible lower bucket level position for better carrying, results in faster operation. Low carrying position also keeps dusty materials from blowing into driver's eyes.

These are only a few of the advantages of the Jaeger Auto-Scoop, the material handler designed specifically for most efficient scoop loader operation. For complete facts, send for Catalog L12-4 and name of the Jaeger distributor nearest you.




5" shorter turning radius (only 6'6").



Higher dumping clearance of 4'6" under lip (6'8" under hinge) and longer reach (2'7") give greater range of load placement.

For bigger work, Jaeger offers the 1 cu. yd. Load-Plus, with torque converter, power steering and either front-wheel or 4-wheel drive.

**JAEGER LOAD PLUS auto-scoop**

**The Jaeger Machine Company, 502 Dublin Avenue, Columbus 16, Ohio**

AIR COMPRESSORS • PUMPS • MIXERS • PAVING MACHINES

*Distributors throughout U. S. and Canada and Principal Cities of the World*

*Hundreds of hours longer . . .*

## NORBIDE® Pressure Blast Nozzles

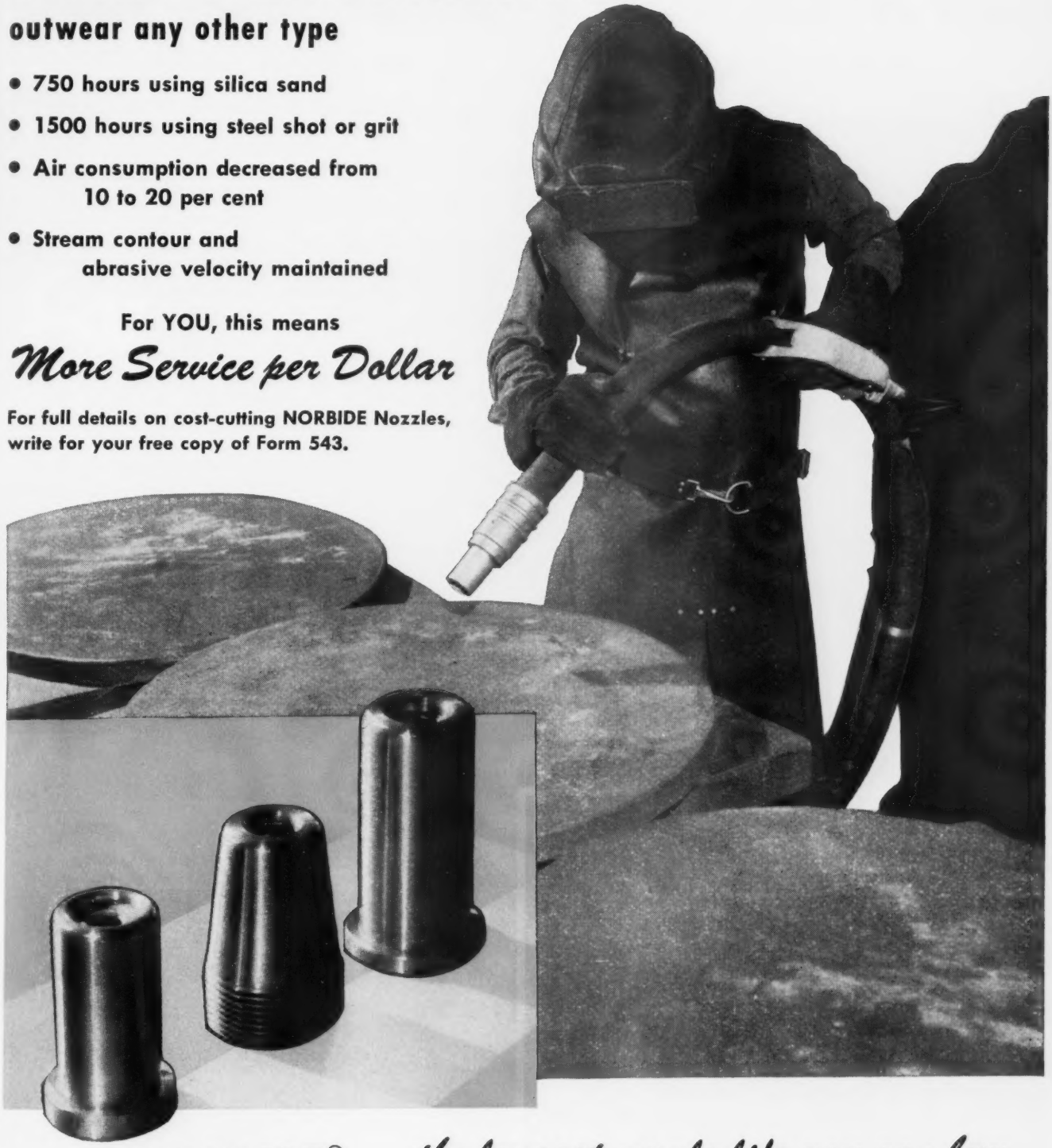
### outwear any other type

- 750 hours using silica sand
- 1500 hours using steel shot or grit
- Air consumption decreased from 10 to 20 per cent
- Stream contour and abrasive velocity maintained

For YOU, this means

*More Service per Dollar*

For full details on cost-cutting NORBIDE Nozzles, write for your free copy of Form 543.



**NORBIDE®... *the longest nozzle life you can buy***

NORTON
BORON CARBIDE

**NORTON COMPANY**

43 New Bond Street • Worcester 6, Mass.

*Making better products . . . to make other products better*

# SAN-BLO

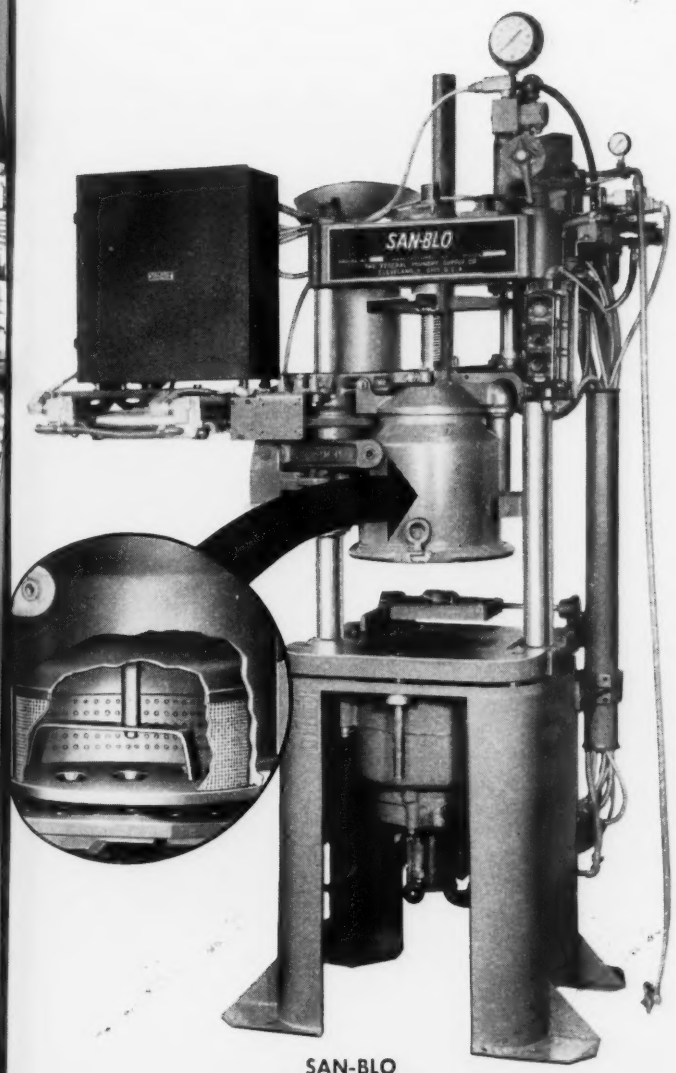
Section of the core room in a prominent mid-western production foundry. Cores shown were blown on SAN-BLO machines, in metal core boxes.

These three SAN-BLO machines blow cores for quick drying in a dielectric dryer. Eleven additional SAN-BLO core blowers are grouped around the tower oven

# FAST... VERSATILE!

## WITH MINIMUM CORE BOX WEAR

HERE'S WHY SAN-BLO CORE BLOWERS ARE *STANDARD EQUIPMENT* IN SO MANY *PRODUCTION* FOUNDRIES . . .




SAN-BLO
CORE BLOWER
Model 40-D8-LPP

**SPEED** A number of *exclusive* features contribute to the SAN-BLO's unusually high speed. Its "cyclo-air" sand chamber is *never* changed—no time lost changing magazines! It blows all core sizes within machine capacity, and *all* of them at maximum efficiency. 80% of the sand magazine load is actually delivered into core boxes, so the magazine needn't be refilled after every blow. Changing blow plates is fast, too! It's done by merely lifting out a clevis pin and spreading a hinged clamp ring. *No unbolting!* Sand magazine is quickly adjusted to accommodate various height core boxes. This provides the shortest possible draw stroke and eliminates special "stooling" or machine modifications. The self-adjusting, oil-controlled draw, with automatic change from slow to fast, insures maximum speed and accuracy.

**WEAR** "Low pressure prefill", another *exclusive* SAN-BLO feature, minimizes core box wear opposite blow holes. A cushioning layer of sand is "riddled" into the core box, *before* full line pressure is automatically applied for ramming. There's no direct sand-blasting effect opposite blow holes—no need for replaceable, hardened-steel plates in the core box. Prefill pressure and timing are adjustable to suit all core boxes, so you really get fast, efficient core production on the SAN-BLO.

**SAND** The SAN-BLO's "cyclo-air" sand chamber, with motor-driven agitator and aerating air circuit, handles *all* practical foundry core sands with *equal efficiency*. It eliminates the need for special sand mixes, usually considered necessary because of core blowing machine limitations.

First step to take, to increase your core room production and reduce core costs, is to write our home office and request a sales-engineer to call.

FEDERAL

*San-Blo Division*

*The* **FEDERAL FOUNDRY SUPPLY** *Company*

4600 EAST 71st STREET, CLEVELAND 5, OHIO

SALES OFFICES IN . . CHICAGO . . DETROIT . . . LOS ANGELES . . . MILWAUKEE . . . NEW YORK

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

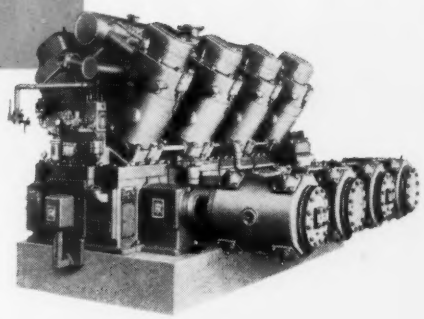
for

generating

# AIR POWER

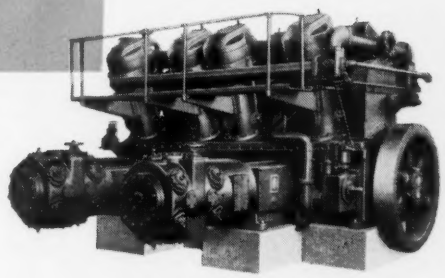
**with OIL**

type SVO
diesel
driven



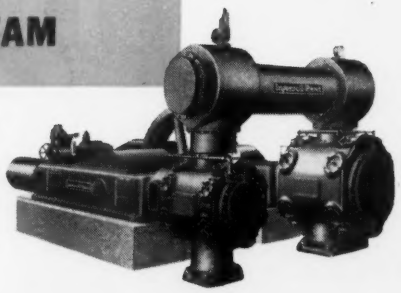
**with GAS**

type KVG
gas
driven



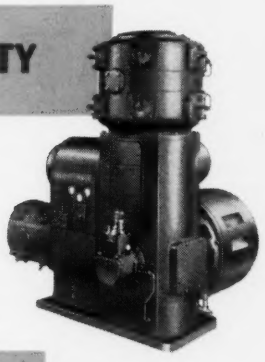
**with STEAM**

type XPV
steam
driven



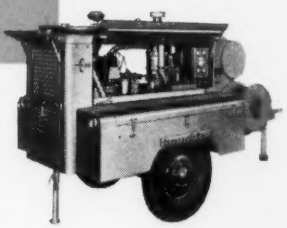
**with ELECTRICITY**

type XLE,
one of many types
electrically
driven



**with GASOLINE**

GYRO-FLO
gasoline driven
portable
(also available with
diesel engines)



**SELECT AN INGERSOLL-RAND COMPRESSOR**

- If you need air power generated by a compressor using any of these methods of drive —
- If your requirements for compressed air are between a vacuum and 15,000 pounds per square inch —
- If you need a machine within the range of ½ to 4000 hp —

Ingersoll-Rand is the world's largest manufacturer of compressors. The complete line includes more than 1000 sizes and types. Within this extensive selection you will be able to find a compressor to meet your most exacting requirements.

Your nearest Ingersoll-Rand engineer will be glad to help you solve your compressed air problems. He will be able to supply complete information about the compressor you need.

**Ingersoll-Rand**

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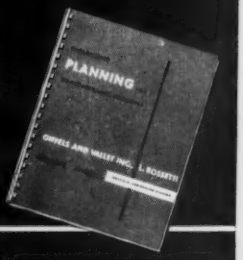
COMPRESSORS • CONDENSERS • BLOWERS • PUMPS • ROCK DRILLS • AIR TOOLS • DIESEL ENGINES

# *Experience is important*

## . . . IN PLANNING YOUR AUTOMATED PLANT

AUTOMATION has been engineered into Giffels & Vallet projects for many years. Although it was then not identified as Automation by name, it *did* produce automatic operations of many types. Automatic shakeouts in foundries—automatic stackers in board plants—automatic surge storage between machines—and many other applications throughout industry.

Automation is but one phase of the comprehensive planning and engineering services provided by Giffels & Vallet. Rubber, Plastics, Metalworking and Cement—these are but a few of the widely diversified industries Giffels & Vallet is serving. These services are discussed in a special Planning Brochure, and a copy will be mailed upon request.




Engineers and Architects serving Industry for over 30 Years

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Giffels & Vallet

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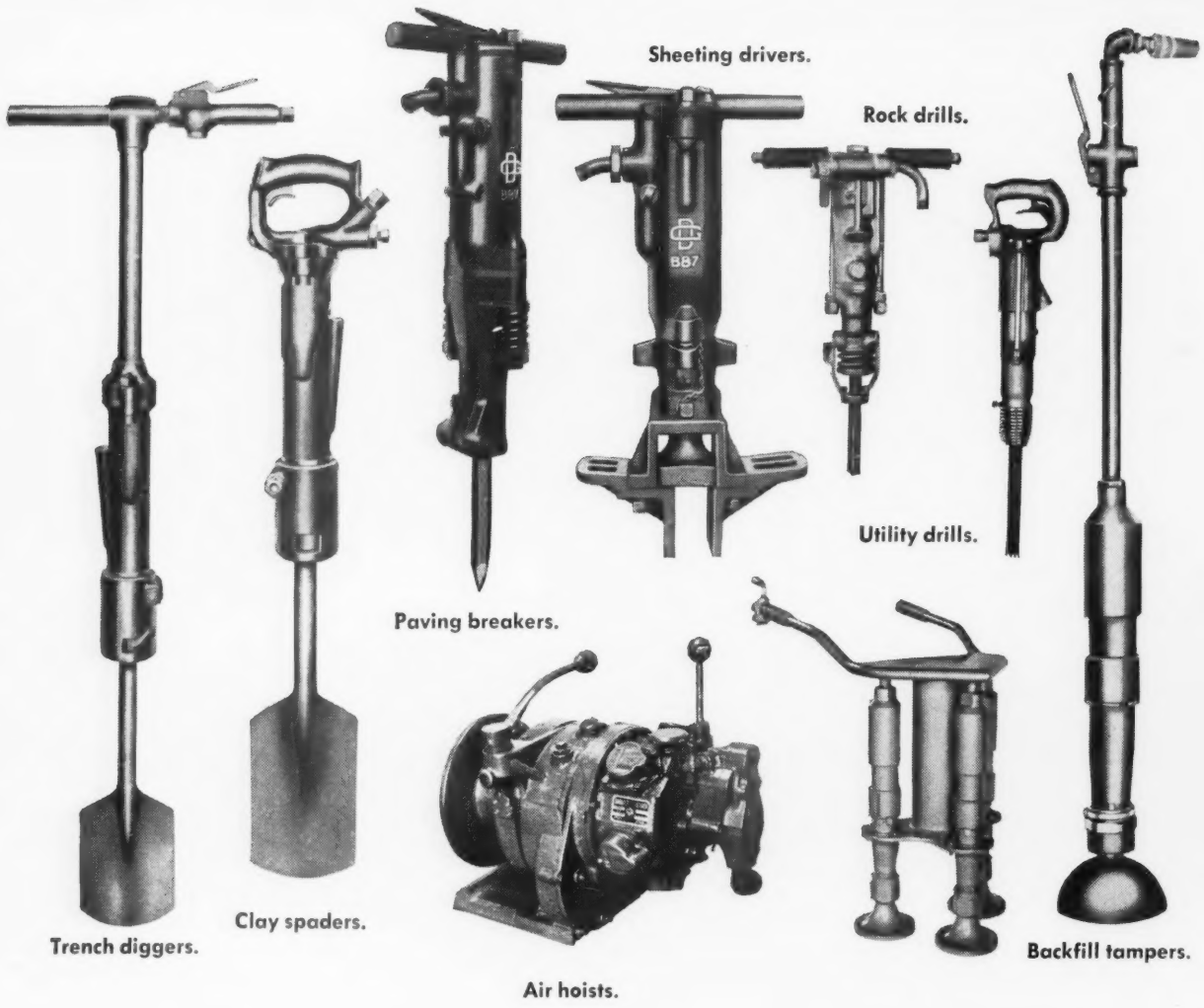
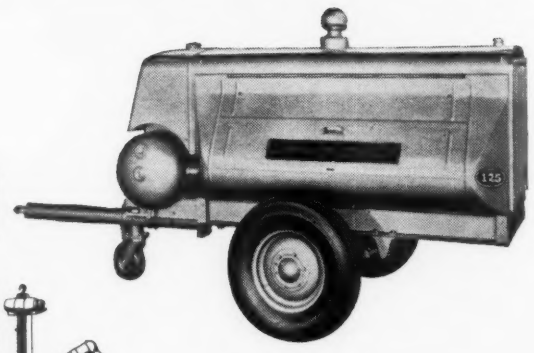



# Gardner-Denver Maintenance Tools make plant housekeeping easier

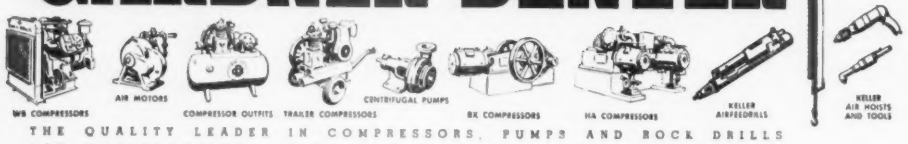
Good industrial maintenance often calls for concrete demolition, masonry drilling, heavy lifting, tough digging, firm backfilling — jobs done quickly and easily by the crew that's equipped with these costsaving Gardner-Denver Air Tools —

**Write for descriptive bulletin.**



The Gardner-Denver WH-125 — puts compressed air where you need it for operating these tools — for cleaning — for paint spraying.

## GARDNER-DENVER




THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

**Gardner-Denver Company, Quincy, Illinois**

**In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario**

**PROFIT**
*Pictures*

Thin, high-strength shell walls bonded with Resinox save man-hours, shop space and money.

# Picture of a man cutting costs 30%

In most casting jobs, the two critical factors are quality and cost. "But when you're casting aircraft parts, which is our specialty," says Earl Donelan, Superintendent of Thompson Product's Kolcast Division in Cleveland, "you don't tamper with quality. It's cost that gets the double squeeze.

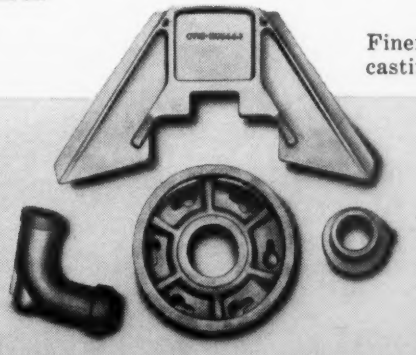
"Shell molding, using Monsanto's *Resinox*® resins, has enabled us to reduce weight of castings, increase sectional changes in the part, cut finishing costs, maintain closer tolerances, cast thinner walls, reduce mismatching and core-shift by 50%, and lower our final customer cost by more than 30%."

Mr. Donelan is also sold on Monsanto's technical service. He explains it this way:

"When we first thought of shell molding back in 1951, we turned to Monsanto. They literally moved in and lived with our problems. They rolled up their sleeves and worked out kinks in sand and core mixtures until we had what we wanted. Monsanto's customer service, like Monsanto resins, is second to none."

For research-developed and shop-tested resins to meet *your* foundry needs, for shell molding, core binding or sand conditioning, write first to Monsanto Chemical Company, Plastics Division, Springfield 2, Mass.

®Reg. U.S. Pat. Off.



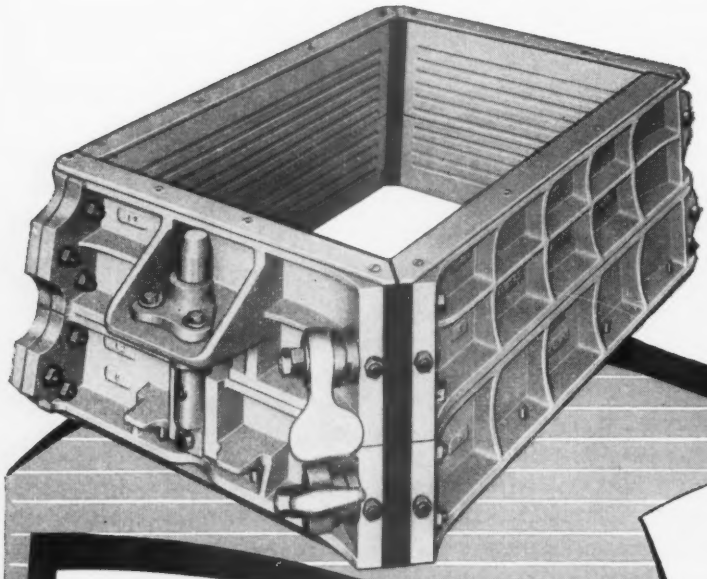
Finer surface finish, fewer rejects, closer tolerances are results of casting with shell molds bonded with Monsanto quality Resinox resin.

MONSANTO

RESINOX®

*The Last Word*

# FREMONT SPREADLOCK FLASKS

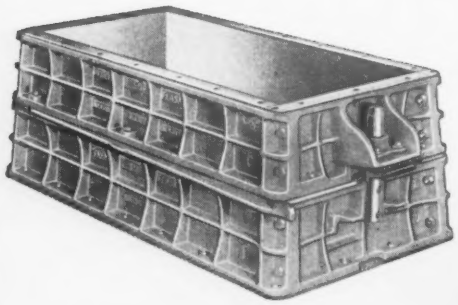


No sand can lodge in the open corners of Spreadlock flasks. The corner gaps are completely closed by long-life, easily replaceable, live rubber inserts. Made of magnesium, which has twice the tensile strength of aluminum, they afford much longer service and are easier to handle. Accurately machined inside surfaces and flanges, and steel-faced top and bottom flanges assure more exacting work.

**PERFECT ALIGNMENT INDEFINITELY!**

Guaranteed by the one-inch GROOVLOCK FOOLPROOF PIN on

**FREMONT STANDARD SLIP FLASKS**



Particularly adapted to cope or drag pattern jobs. Solid, bolted and welded corner construction. Other types of standard pin fittings available.

**SAVE BIG MONEY!**

The precision machined and drilled, bolted corner construction of

**FREMONT CAST IRON OR CAST ALUMINUM JACKETS**

permits easy insertion of new sides or ends. Entire jacket need not be scrapped. The standard style is designed for ordinary foundry practice, the grooved style, which permits ready gas escape, is ideal for steel foundries. Flasks and jackets can be assembled on 3°, 4° or 5° taper.

Write today for free literature and prices. All orders given prompt attention.

**THE FREMONT FLASK CO.**

Fremont, Ohio

# CORE AND MOLD WASHES FOR ALL FERROUS AND NON-FERROUS FOUNDRIES

WRITE FOR ENGINEERING BULLETIN NO. 17

MANUFACTURED BY

# THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

MEXADIP
A PRODUCT OF THE UNITED STATES GRAPHITE COMPANY SAGINAW, MICHIGAN
50 POUNDS NET
COLUMBIAN PLUMBAGO
A PRODUCT OF THE UNITED STATES GRAPHITE COMPANY SAGINAW, MICHIGAN
50 POUNDS NET
MEXICAN 172
A PRODUCT OF THE UNITED STATES GRAPHITE COMPANY SAGINAW, MICHIGAN
50 POUNDS NET
MEXICAN 700
A PRODUCT OF THE UNITED STATES GRAPHITE COMPANY SAGINAW, MICHIGAN
MEXACOTE
A PRODUCT OF THE UNITED STATES GRAPHITE COMPANY SAGINAW, MICHIGAN
CORDIP 70
A PRODUCT OF THE UNITED STATES GRAPHITE COMPANY SAGINAW, MICHIGAN
No. 866
A PRODUCT OF THE UNITED STATES GRAPHITE COMPANY SAGINAW, MICHIGAN
50 POUNDS NET
SLICKRITE
A Product of THE UNITED STATES GRAPHITE COMPANY Saginaw, Michigan

| | MOLDS | | | | | | CORES | | | | | | COAT | | SUGGESTED BAUMES FOR VARIOUS APPLICATIONS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LARGE | | MEDIUM | | SMALL | | LARGE | | MEDIUM | | SMALL | | | | SPRAYING | | | DIPPING | | BRUSHING |
| | Green Sand | Torch, Skin Dried or Dry | Green Sand | Torch, Skin Dried or Dry | Green Sand | Torch, Skin Dried or Dry | Green | Baked or Dry | Green | Baked | Green | Baked | Hard | Soft | Green Cores | Dry Cores | Molds | Dry Cores | Green Cores | Dry Cores | Molds |
| **MEXADIP®** (with binder)<br>Best for high production. High metal temperature core coating for green and baked cores. Inert, will not ferment. For gray iron, brass, bronze and aluminum. | | | | | | | | | Spray or Dip — Best | Spray or Dip — Best | Spray or Dip — Best | Spray or Dip — Best | Very Hard | | 18°-22° | 24°-30° | | 26°-36° | 14°-22° | 38°-42° | |
| **MEXICAN® 172** (with binder)<br>Excellent applied as a wet blacking on large cores and molds for heavy sectioned castings. All metal temperatures. Also best as dust bag facing for green sand molds and large cores. | Dust Bag — Best | Spray or Brush Best | Dust Bag — Best | Spray or Brush Best | Dust Bag — Good | | Dust Bag — Best | Spray or Brush Best | | | | | Medium Hard | | | 45°-50° | 45°-50° | 32°-38° | | 50°— | 50°— |
| **COLUMBIAN PLUMBAGO** (without binder)<br>Good as wet blacking. All metal temperatures. With care can be used as slicking lead on green sand molds. | Good | Spray or Brush Good | Slicking Possible — Good | Spray or Brush Good | Slicking Possible — Good | | Slicking Possible — Good | Spray or Brush Good | | | | | | Very Soft | | 45°-50° | 45°-50° | | | 50°— | 50°— |
| **NO. 866®** (without binder)<br>Very good blacking for bell end cores used in pressure pipe manufacture. | | | | Spray or Brush Good | | Spray or Brush Good | | | Spray & Swab — Good | Spray & Swab — Good | Spray & Swab — Good | Spray & Swab — Good | | Soft | | 40°-45° | 40°-45° | | | 40°-45° | 45°— |
| **CORDIP® 70** (with binder)<br>Excellent as inexpensive dust bag facing. Good for all medium temperature mold and core applications. | Dust Bag — Good | | Dust Bag — Good | Spray — Good | Dust Bag — Best | Spray — Best | Dust Bag — Good | | | Spray Brush or Dip Good | | Spray Dip — Good | Hard | | | 40°— | | 35°-40° | | 40°— | |
| **MEXICAN® 700** (without binder)<br>Best as wet blacking where large castings are poured at medium temperatures. Excellent for ingot mold production. | | Spray or Brush Good | | Spray or Brush Good | | | | Spray or Brush Good | | | | | | Soft | | | 40°— | | | 40°— | 40°— |
| **MEXACOTE®** (with binder)<br>A versatile wet blacking for both molds and cores. Medium to high temperature iron. Used as permanent mold coating. | | | | Spray or Brush Good | | Spray or Brush Best | | | Spray or Dip Good | Spray or Dip Good | Spray or Dip Good | Spray or Dip Good | Hard | | 25°-30° | 40°— | 40°— | 40°— | 25°— | 40°— | 40°— |
| **SLICK RITE®**<br>For best surface on green sand. All metal temperatures. For gray iron, bronze and brass. | Slicked Best | | Slicked Best | | Slicked Best | | Slicked Best | | | | | | | Soft | | | | | | | |

**USE THIS CHART—SAVE MONEY • APPLY CORE AND MOLD WASHES MANUFACTURED BY**

# THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

# Growing Foundries keep a Scottish eye on costs

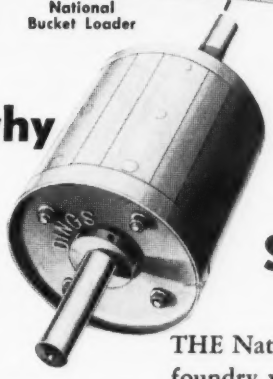
Simpson Mix-Muller

National Bucket Loader

Conveyor—Screening Unit

Hopper

## ...that's why there's a Dings Magnetic Separator on National's New "Utility" Sand Conditioning Unit



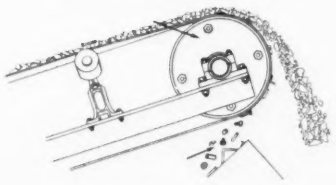
Dings Magnetic Pulley

THE National Engineering Utility unit is engineered for the small to medium-sized foundry with big plans. It screens, mulls, aerates and magnetically separates sand for re-use with a minimum of hand operations—offers big foundry mechanization at small foundry cost.

Foundrymen will appreciate the built-in Dings magnetic separator—now regarded as essential equipment by most operators. This Dings Magnetic pulley will soon pay for itself in several ways; it eliminates iron contamination, improving sand and casting quality; it reclaims valuable scrap metal; and reduces maintenance and repair costs on other preparation equipment.

When you're purchasing sand preparation equipment remember these advantages. There's a Dings Magnetic Separator to do this work in foundries of any size. Get acquainted with the Dings line—*write for* CATALOG C-5000-B, *today.*

**HERE'S HOW THE MAGNETIC PULLEY WORKS —**



***SAND FLOWS** over pulley crown in normal trajectory. Magnetics are held fast to belt by magnetic pull, discharged separately.*

**Dings**
MAGNETS

**DINGS MAGNETIC SEPARATOR COMPANY**
4708 W. Electric Ave., Milwaukee 46, Wis.

*PLEASE SEND ME CATALOG C-5000-B.*

Name_____

Title_____

Firm_____

Address_____

PPU-153

*Knight services include:*

**Foundry Engineering**
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**Standard Costs**
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**Flexible Budgeting**
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**Modernization**
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**Mechanization**
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**Methods**
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**Materials Handling**
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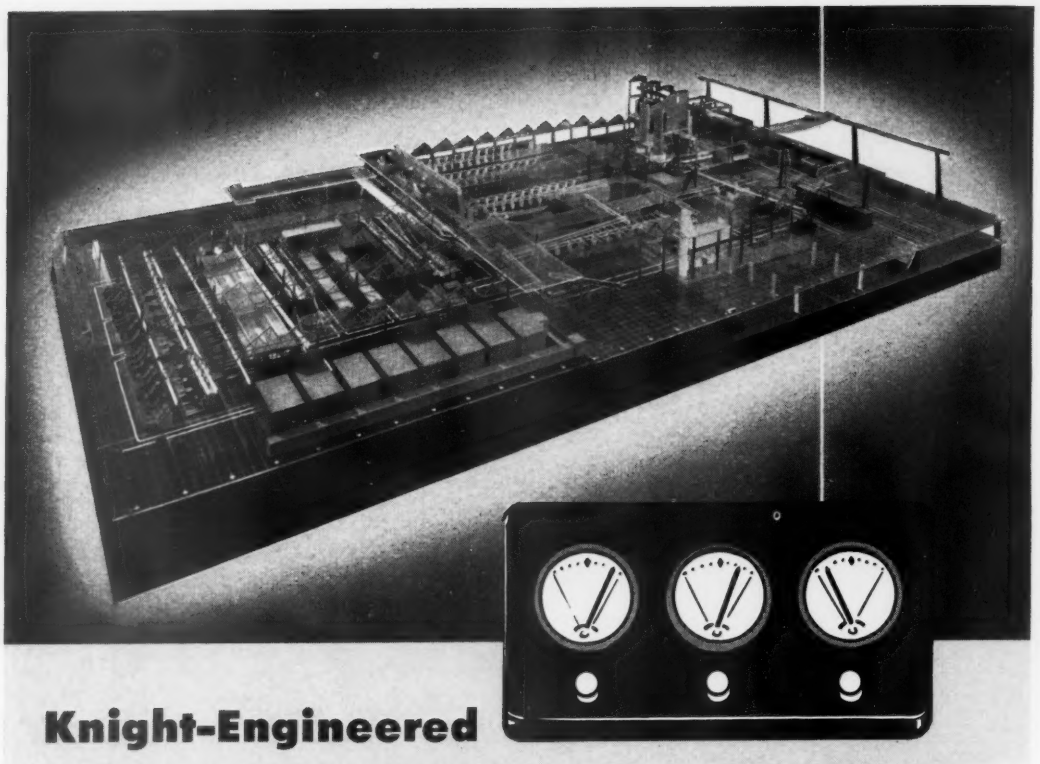
**Survey of Facilities**



## Knight-Engineered

# AUTOMATION

## increases labor productivity 52% in major foundry

Experienced Knight Engineers, working closely with the client's staff, completed the automation of this foundry unit 18 months ago.

The successful integration of foundry operations into a continuous production sequence, *from raw material to finished product*, increased over-all labor productivity 52%. In one operation alone, 9 men now produce what 53 men formerly produced.

Automation has also accelerated materials handling, established uniform product standards, improved worker morale, increased space productivity 33%, and brought major economies throughout the over-all operation. Necessary changes were scheduled progressively so that automation was accomplished without interrupting production.

The successful operation of this foundry is just one example of Knight's practical experience in the engineering services that increase foundry productivity and decrease unit costs.

Your operation will benefit by the comprehensive experience of Knight Engineers who have completed approximately 400 foundry assignments. A letter will bring a call from a Knight representative at your convenience.

EVIDENCE OF EXPERIENCE

# Lester B. Knight & Associates, Inc.

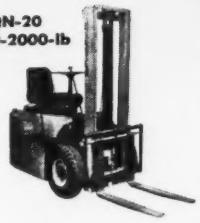
*Consulting Engineers*

MEMBER OF THE ASSOCIATION OF CONSULTING MANAGEMENT ENGINEERS, INC

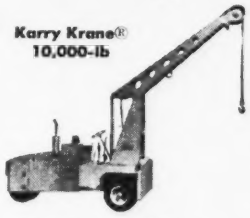
**600 W. Jackson Blvd., Chicago 6**

*917 Fifteenth St., N. W., Washington 5, D. C. • Lester B. Knight & Associates, 50 Church St., New York 7*

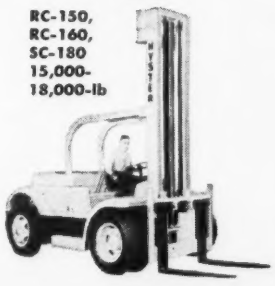
QN-20
1000-2000-lb

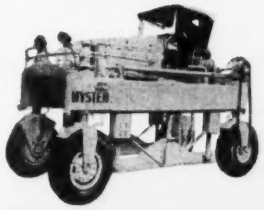


Karry Krane®
10,000-lb



RC-150,
RC-160,
SC-180
15,000-
18,000-lb





MH Straddle Truck® 30,000-lb

# THE BEST PLACE TO BUY A GOOD USED LIFT TRUCK IS YOUR HYSTER DEALER

**Only Hyster® Dealers offer "HY-QUALITY" Warranted Used Lift Trucks!**

You can depend on
**Hyster Service**
...wherever you are

Another big reason why Hyster Dealers are selling used lift trucks about as fast as rebuilding and reconditioning schedules permit is the Hyster "Personalized Finance Plan", offering every known and accepted method of financing and leasing. Individualized terms to suit your pocketbook... nothing down; rental with option to buy; lease with option to re-lease, etc. The Hyster "Personalized" Plan often makes it possible to buy a good used lift truck directly out of the savings effected.

Many businesses today are taking advantage of Hyster Warranted Used Lift Trucks to try out lift truck methods in borderline cases, or to provide individual lift trucks for special operations or services.

Each Hyster "Warranted" Used Lift Truck is thoroughly inspected and reconditioned or rebuilt by factory-trained mechanics. Whether you operate a fleet of lift trucks—or are considering the purchase of one truck, call your Hyster Dealer. He may have just the right used truck for you, or can quickly get one from another Hyster Dealer.

THERE'S PROFIT IN
**HYSTER POWER**

*TRUCKS OF ALL SIZES AND MAKES at your Hyster Dealer*

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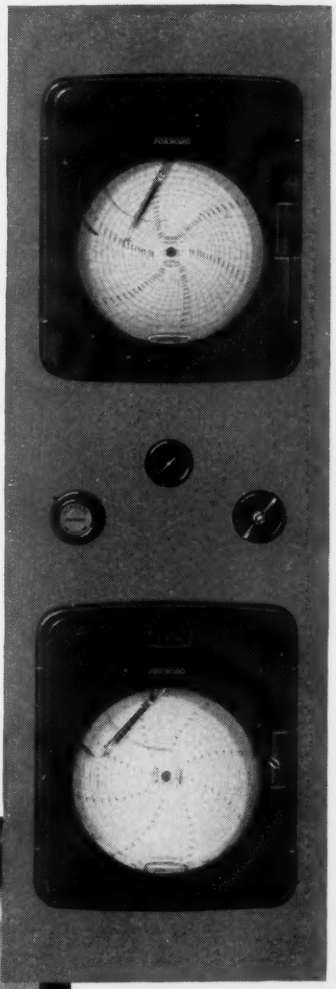
HYSTER

# Improves Any Cupola's Performance . . . Automatically!

## Foxboro Air Weight Control . . .

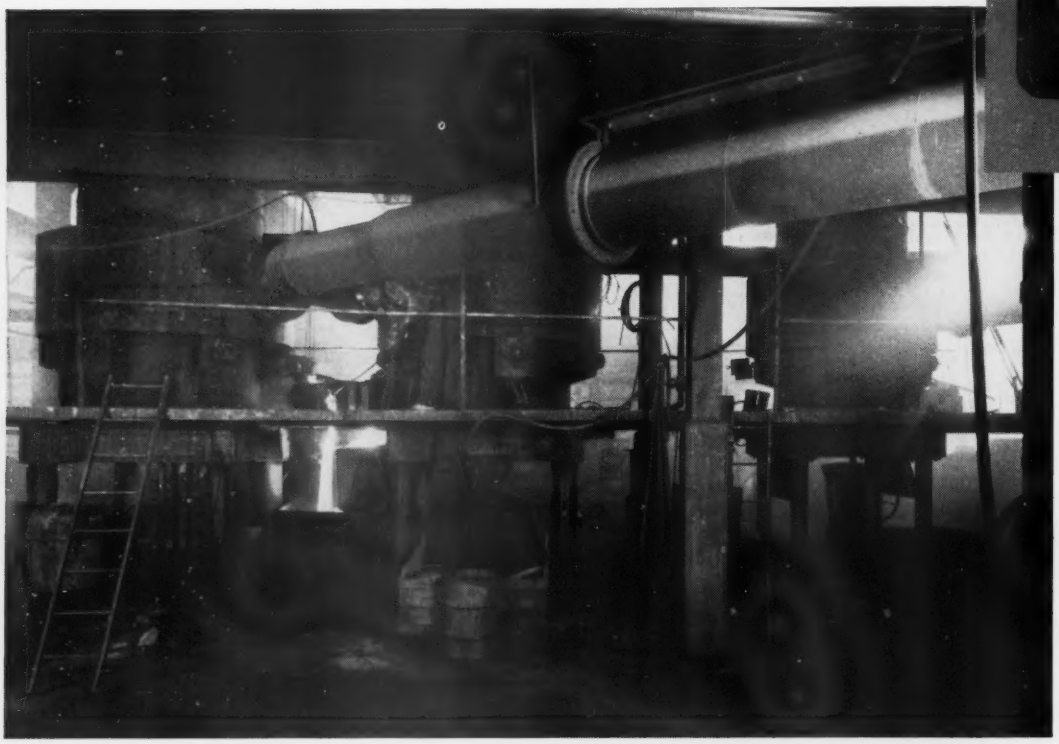


More than 1500 successful applications prove it! Foxboro Air Weight Control *automatically* assures higher, more uniform temperatures . . . whether it's on a small, hand-charged unit, or a continuous hot blast melting system.

Here's why. The Foxboro Air Weight Controller automatically "weighs" air for the cupola blast . . . corrects for atmospheric changes. Coke charge always gets the right amount of oxygen for best combustion, regardless of the weather. The pay-off is faster, more uniform melting . . . higher quality castings day after day. What's more, there's a substantial fuel saving, and practically *no* pigging!

Whether *your* cupola is simple or highly mechanized, Foxboro Air Weight Control is fundamental to its top performance. For full details, write for Application Engineering Data Sheet, or contact a Foxboro Sales Engineer.

Modern Foxboro Cupola Control Panel includes, in addition to Air Weight Controller, a Foxboro Windbox Pressure Recorder which charts cupola conditions . . . permits operator to quickly correct for changes.



In typical installation (left), two Foxboro Air Weight Controllers regulate blast from two Spencer Blowers. Blowers supply one #3, and two #6 Whiting Grey Iron Cupolas.

THE FOXBORO COMPANY, 324 NEPONSET AVENUE, FOXBORO, MASSACHUSETTS, U. S. A.

FOXBORO® REG. U. S. PAT. OFF. AIR WEIGHT CONTROLLERS

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

# giant cleaning jobs MADE EASY

## 5-Ton Loads Cleaned in Minutes with this Wheelabrator® Tumblast

*Big Pay Loads* — 10,000 pounds of steel castings spotlessly cleaned in from 12 to 20 minutes in a 63" x 96" Wheelabrator Tumblast . . . provide big savings for Maynard Electric Steel Castings Co., Milwaukee. As a result of the cost-reducing, speed-cleaning performance of this 70 cu. ft. capacity airless blast machine, Maynard was able to slash overall cleaning time 25% even with a 33-1/3% increase in casting tonnage.

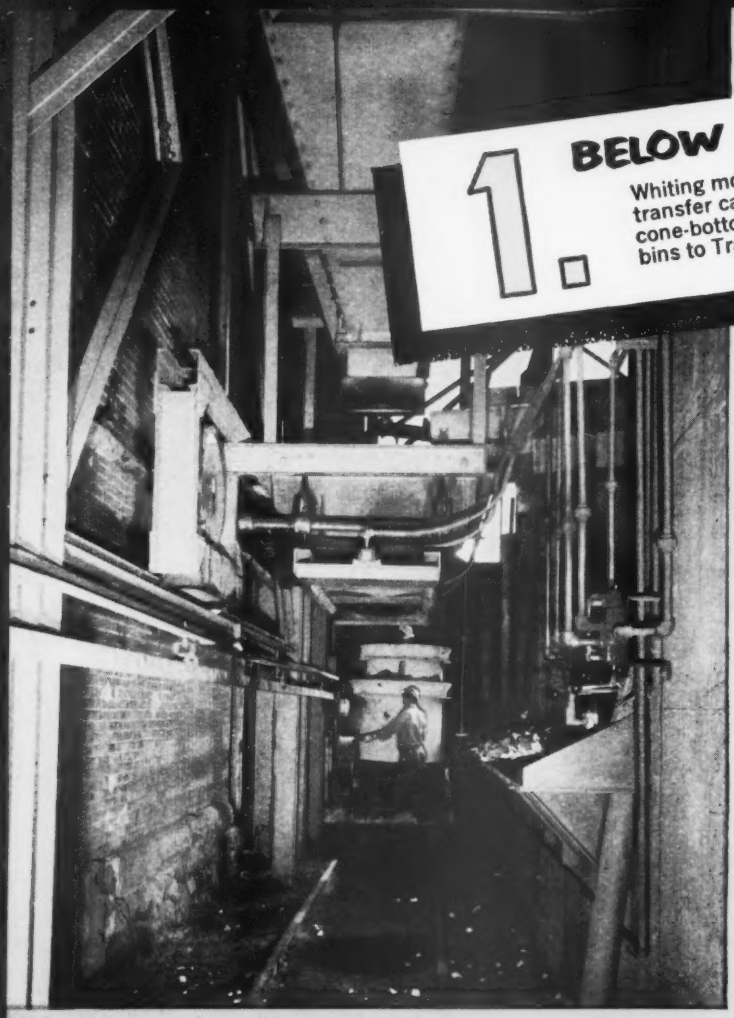
Formerly all cleaning was done in three air blast rooms working two nine hour shifts . . . 72 man hours daily. All cleaning is now performed with only 54 man hours charged to the cleaning room. This reduction is due to the ability of the Wheelabrator Tumblast to handle pieces weighing up to 8,000 pounds each and to clean mixed loads weighing up to five tons.

Even though your cleaning requirements may not be on this large a scale, the airless Wheelabrator will provide improved cleaning performance at greatly reduced cost for any size problem. More than 6,000 Wheelabrators are now in operation. Write today for the complete story on this modern cost-cutting cleaning method. Ask for Catalog 74-B.

**American WHEELABRATOR®**

*World's largest builder of airless blast equipment*

AMERICAN WHEELABRATOR & EQUIPMENT CORP., 503 S. Byrkit St., Mishawaka, Indiana



**1. BELOW DECKS**

Whiting motor-operated transfer car carries loaded cone-bottom buckets from bins to Trambeam charger.

## COOPER-BESSEMER GETS

# Team Action

## IN MAKE-UP, CHARGING AND MELTING!

Here's how "team action" serves the foundry of Cooper-Bessemer Corporation, Mount Vernon, Ohio. A Whiting-engineered material handling and charging system assures a *fast, smooth flow of materials* . . . a Whiting cupola provides *economical melting*. Increased efficiency at lower cost is the important, overall result!

Here's how their system works: A Whiting 10-ton overhead yard crane with electrically operated bucket and magnet moves all raw materials—scrap, coke and stone—to storage bins. Then charges are weighed in batch hoppers and discharged into Whiting full cone-bottom charging buckets. After being loaded, buckets move on a Whiting motor-operated transfer car to a Whiting Trambeam cab-operated monorail charging crane which lifts the loaded bucket to the charging opening in a Whiting Cupola.

The entire operation requiring only *three men per shift*—crane operator, Trambeam charger operator and transfer car operator—makes possible a capacity of 75 tons per day at a lower cost per ton. Every foundry, large or small, can reduce its costs and increase capacity with a Whiting-engineered charging system. Talk it over now with a Whiting engineer . . . *it will pay off quickly!*

**WHITING CORPORATION**

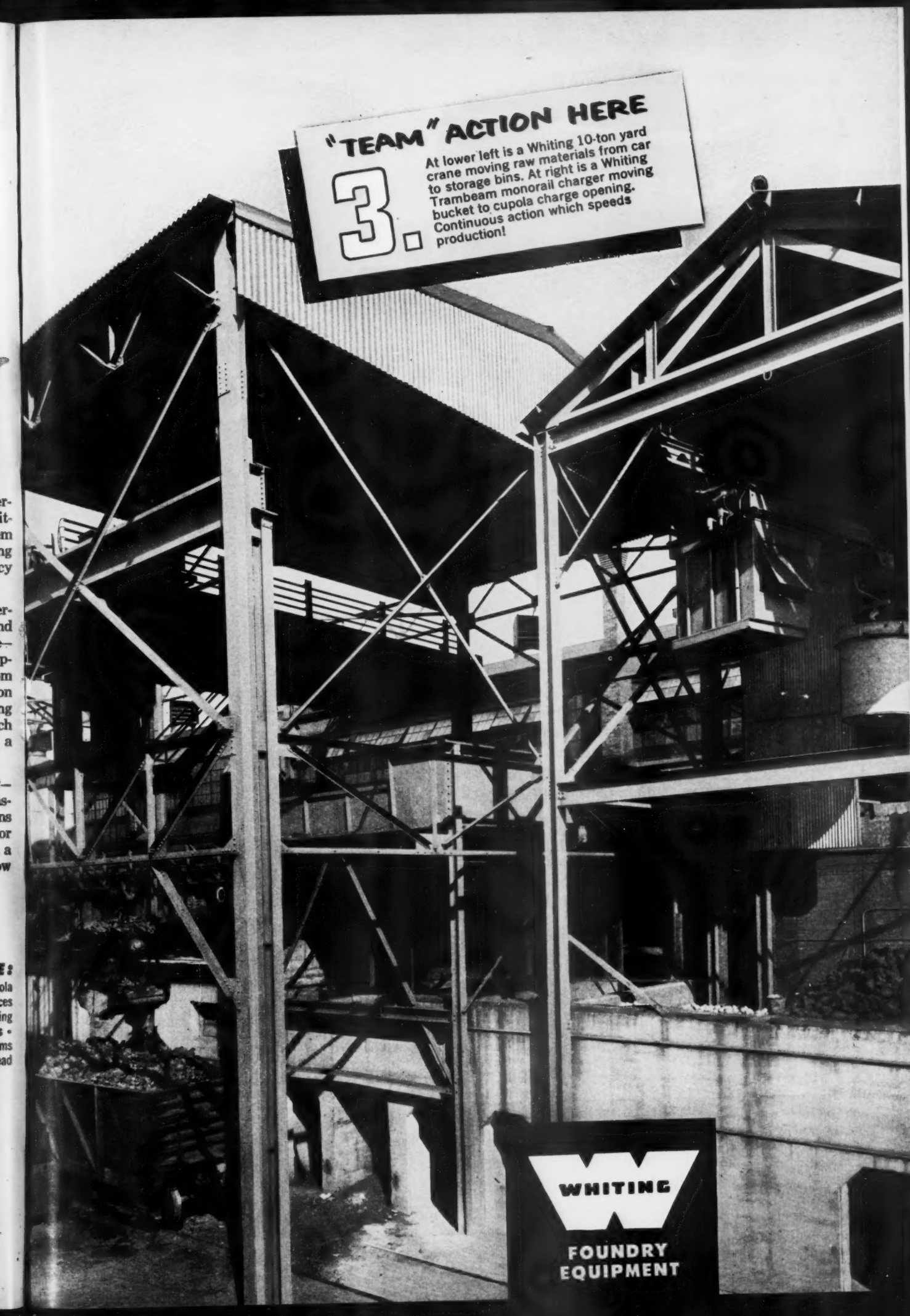
15607 Lathrop Avenue, Harvey, Illinois

***WHITING FOUNDRY PRODUCTS INCLUDE:***

Cupolas • Cupola Spark Suppressors • Cupola Hot Blast Equipment • Cupola Blast Moisture Control Equipment • Cupola Charging Systems • Cradle Furnaces • Hot Metal Mixers • Duplex Melting Systems • Air Furnaces • Electric Melting Furnaces • Ladles • Ladle Handlers • Ladle Preheaters • Tumbling Mills • Annealing Ovens • Transfer Cars • Pulverizers • Pulverized Coal Firing Systems • Turntables • Electric Traveling Cranes • Trackmobile • Trambeam Overhead Handling Systems • Electric Chain Hoists.

**2. UP AND OVER**

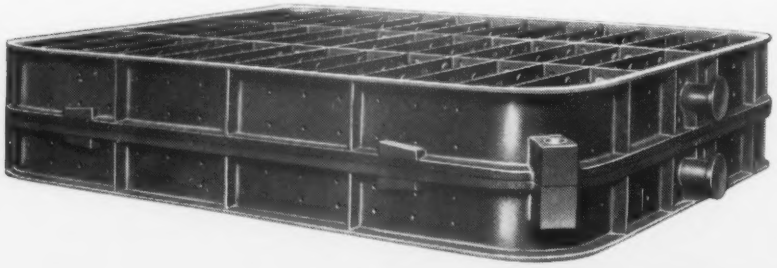
Whiting Trambeam monorail charging crane, cab-operated, lifts buckets from transfer car, moves them in seconds to charging opening of a Whiting No. 6 cupola.


"TEAM" ACTION HERE
3.
At lower left is a Whiting 10-ton yard crane moving raw materials from car to storage bins. At right is a Whiting Trambeam monorail charger moving bucket to cupola charge opening. Continuous action which speeds production!
WHITING
FOUNDRY EQUIPMENT

# EVERYTHING in Steel Flasks

If you have a casting problem which requires a Flask of special shape or unusual construction —call your Shanafelt representative. He will check over the requirements with you and arrange for engineering detail and price quotations on Flasks made exactly the way you want them.

The four illustrations are typical of many special Flasks which were engineered and built here to meet special casting conditions.



Shanafelt Pins and Bushings are made solely for Foundry Flasks. The steel analysis, the tolerances and shapes, the degrees of hardening, are all based on the known requirements of Flask handling. You'll get a correct line-up of cope and drag if your Flasks are equipped with accurate, long wearing Shanafelt Bushings and Pins.

**The SHANAFELT Manufacturing Co.**

*Serving the Foundry Industry for 57 Years*

2600-2700 WINFIELD WAY N. E. • CANTON, OHIO

## FRANKLY SPEAKING...

# --can you afford not to belong?--

**LET'S FACE THE FACT . . .** in the Gray Iron industry, you are in a highly competitive business. You are in competition with other materials and methods . . . in competition with other foundries.

**LET'S FACE THE FACT . . .** who wins in a competitive situation? It's usually the man, or foundry, or material that can do the best job for the customer . . . in quality, in performance, in cost.

**LET'S FACE THE FACT . . .** you can't stand still in a competitive situation. You've got to keep up with your own industry. You've got to keep ahead of competitive materials and methods. Static thinking or static technology soon leaves you or your company with a static or declining backlog and profit margin.

**LET'S FACE THE FACT . . .** throughout the Gray Iron industry there are changes occurring constantly . . . in techniques and in business procedures. In your local marketing area, you are probably aware of these factors. But can you keep up with the entire industry?

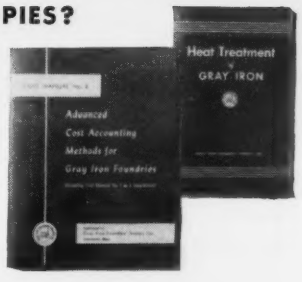
And that's where your membership in the Gray Iron Founders' Society pays off. Through the Society, there is a free interchange of information between Society member foundries. Committees work hard on special projects which benefit the entire industry. And from the Society's headquarters, you are constantly supplied with valuable information and assistance. An ever-growing library of information on practically every phase of the industry is available for your use.

**LET'S FACE THE FACT . . .** can you afford *not* to be a member of the Society? Mail this coupon for full information about how membership in the Society can help you.

# GRAY IRON FOUNDERS' SOCIETY

### DO YOU HAVE YOUR COPIES?

Here are the latest additions to the Society's library . . . *Cost Manual #2* and *Heat Treatment of Gray Iron* containing valuable guides and operating techniques for any progressive Gray Iron foundry.




GRAY IRON FOUNDERS' SOCIETY, INC.
National City-East 6th Building, Cleveland 14, Ohio

Please send full information on Society services and samples of helpful material.

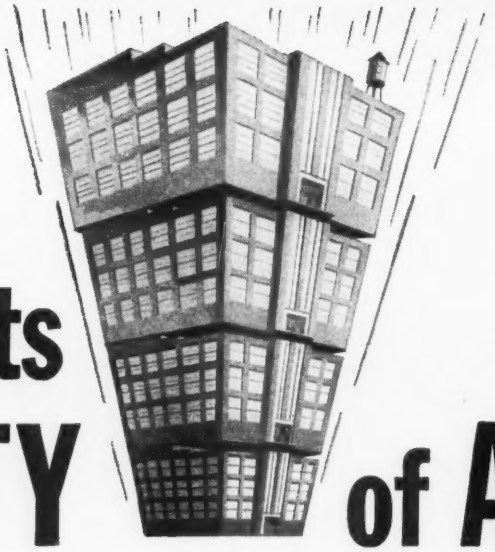
Company _____

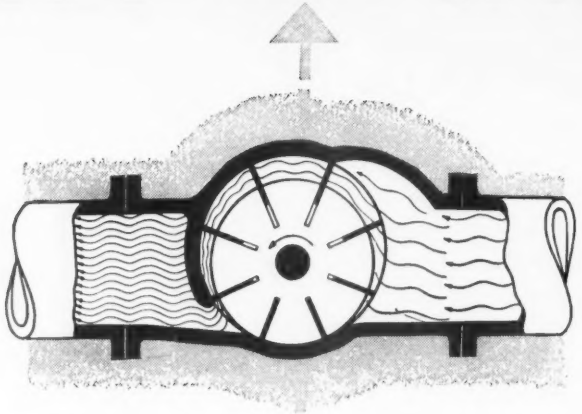
Individual _____ Title _____

Address _____

City and State _____

# Growing Plants need PLENTY of AIR!





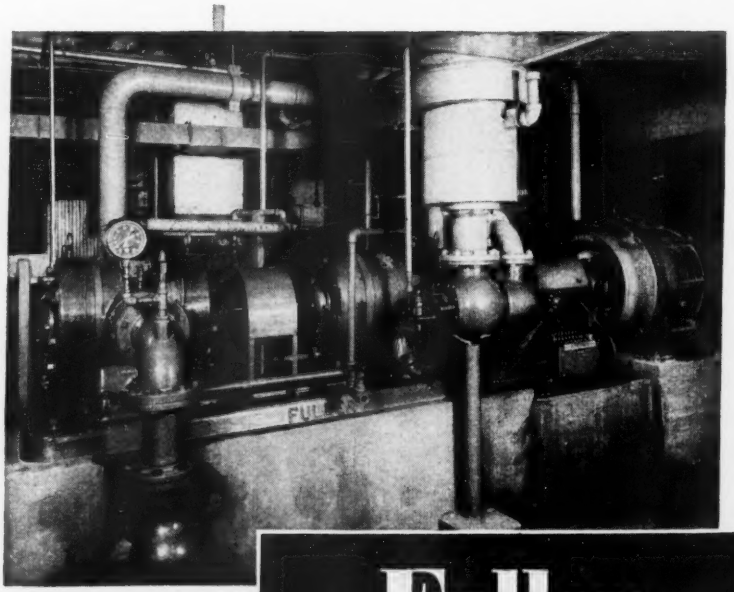
As abundantly demonstrated in thousands of successful installations, the simplest, most economical and most reliable source of compressed air for all pnuematic plant services is the Fuller vane-type Rotary Compressor.

This compressor has an irreducible number of moving parts—rotors, blades and bearings—and for this reason it is ideally adapted for continuous service in out-of-the-way locations without attention.

With direct-connected motor drive and operating with incredible lack of vibration, these compressors run for days on end without even being seen, much less inspected.

When you need such performance, it will pay you to specify Fuller Rotaries—for pressure up to 125 psig. and capacities to 3300 cfm.

Detailed information on design characteristics, and typical applications will be forwarded promptly on request.



**FULLER COMPANY, Catasauqua, Pa.**

GENERAL AMERICAN TRANSPORTATION CORPORATION SUBSIDIARY

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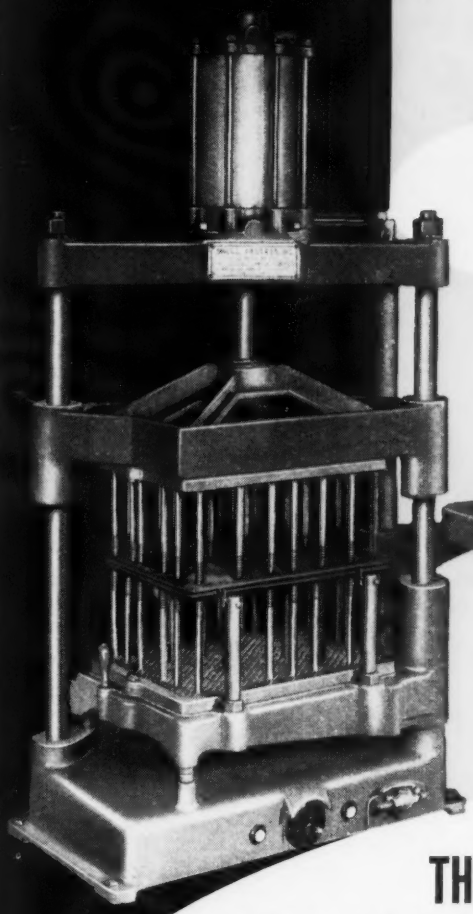
**Fuller**

. . . . pioneers in harnessing AIR

# PUSHBUTTON SHELL BONDING



## THE MOST EFFICIENT SHELL BONDING FIXTURE EVER DEVELOPED!

*(Now reduced in price by more than 15% . . . due to popular demand)*

**Requires 'half' an operator . . . produces top quality shell molds . . . pressure sealing and timing completely automatic.**

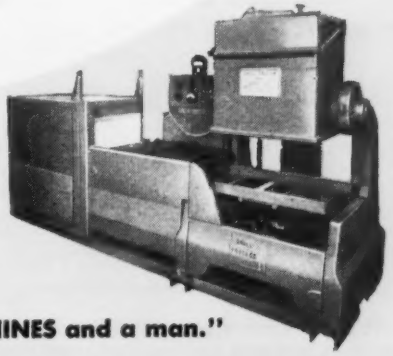
No other method of shell bonding can compare or compete with this remarkable bonding fixture. Cope and drag are joined with thermosetting resin under the overall pressure of adjusting pins. Pressure and timing are automatic.

Shell halves can be bonded faster than they are formed, and produce top quality finless castings . . . tolerances held fast at the parting line. One unskilled worker can easily operate the shell molding machine and bonder.

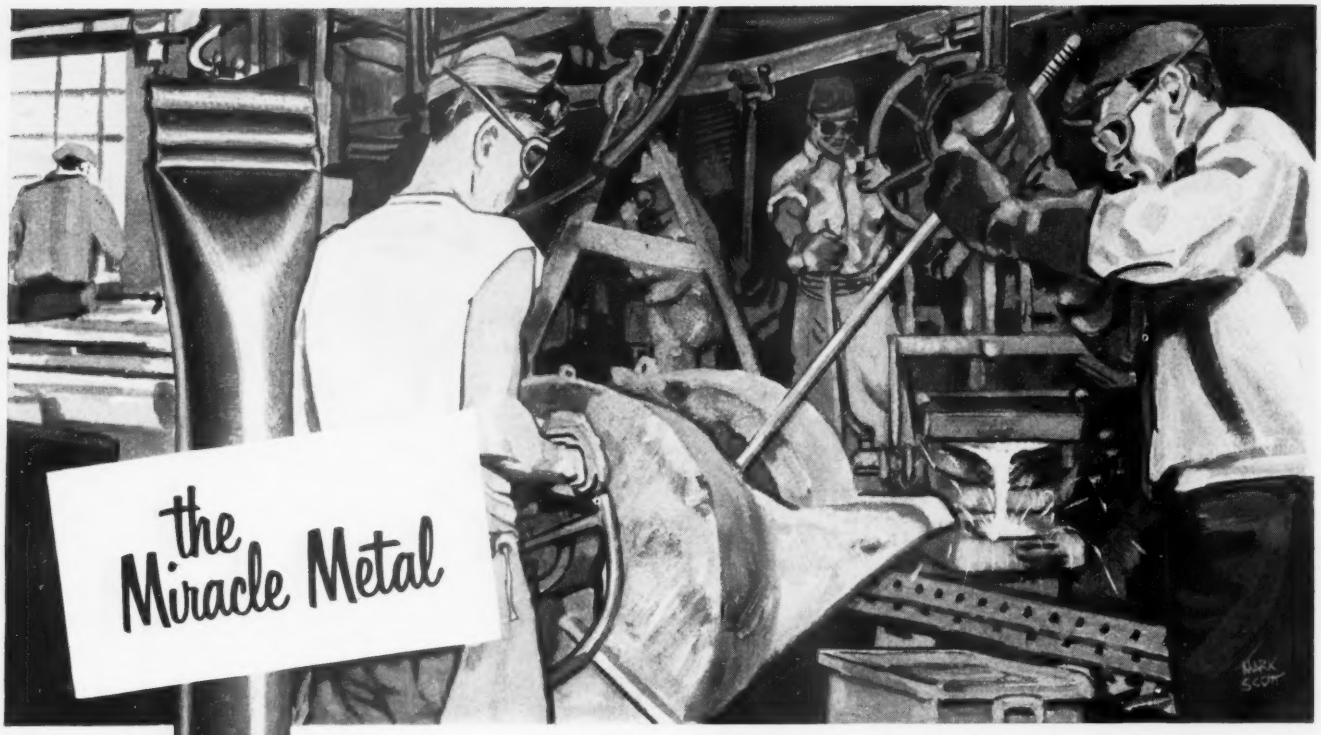
Immediate delivery on 15" x 20" and 20" x 30". Larger sizes available — send us your requirements for quotation.

Team up with Pushbutton Shell Molding and Shell Bonding to increase your production and profits.

**SHELL PROCESS**
INCORPORATED
*Manufacturers of Shell Molding Machines and Allied Equipment*
346 McKinstry Avenue
Chicopee, Mass.



**Biggest profit making team in the shell molding industry is the shell bonding fixture combined with the Shell Process molding machine. Engineered for team work, it's the highly acclaimed set-up of "2 MACHINES and a man."**




# LITHIUM

## Only 0.005% makes a sounder nonferrous casting

Lithium economics and technique are both within the limits of everyday nonferrous foundry operation. A small slug (2¼ grams) of metallic Lithium added to a charge of molten copper effectively removes dissolved oxides and gases. End result is an improved, more uniform casting. By adding Lithium the surer way—in the handier *cartridge* form—you eliminate the "by-guess-and-by-gosh" formulation too common with less satisfactory methods.

Specifically, tensile strength and elongation are increased, porosity decreased, and grain size reduced. Characteristic low density causes the Lithium products formed to float to the surface where they are easily removed as slag. Again, Lithium Cartridges give you a sounder casting with less trouble and at less cost.

Tests under production conditions in nonferrous foundries have long established Lithium in metallurgy as a degasifier, deoxidizer, desulfurizer and general purifying agent. As a degasifier of Nickel Bronze, for example, Lithium Cartridges make possible a dense, fine-grained metal. Hermetically sealed in copper tubing, three sizes—2.25, 4.50 and 9.0 grams—are available.

Investigate Lithium Cartridges. Write for details of actual foundry tests. The small amounts of Lithium required put this revolutionary technique within *your* reach.

The application of Lithium requires no radical changes in conventional melting and casting processes. The cartridges are *quickly* introduced into the lower part of the crucible by wiring them into an inverted piece of angle iron or stainless steel, welded to a long rod handle, to prevent the light cartridge from rising to the surface before the reaction has taken place.

*. . . trends ahead in industrial applications for Lithium*

**LITHIUM CORPORATION OF AMERICA, INC.**
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Rand Tower
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MINES: Keystone, Custer, Hill City, South Dakota · Bessemer City, North Carolina · Cat Lake, Manitoba · Amos Area, Quebec
CHEMICAL PLANTS: St. Louis Park, Minnesota · Bessemer City, North Carolina · RESEARCH LABORATORY: St. Louis Park, Minnesota

A completely new and different

# PAYLOADER®

## TRACTOR SHOVEL

## Powerful break-out digging action

**Fast, efficient bucket-loading action** of the new Model HA "PAYLOADER" begins when the machine moves forward and forces the 18 cu. ft. bucket into the pile with up to 3,100 pounds of push.

**Twin, double-acting hydraulic rams,** independent of the boom elevators, next rotate the bucket on its hinges . . . the cutting edge slices up through the pile in a powerful "break-out" digging action.

**Bucket roll-back of 40°** is now completed. The loaded bucket is close to the machine and low — only six inches off the ground—in a stable, sure position for safe, rapid transport at speeds up to 10 mph.

**Your Hough Distributor is ready to demonstrate this completely new and different Model HA and what it can do.**

SAY "HUFF"

**PAYLOADER®**

MANUFACTURED BY

**THE FRANK G. HOUGH CO. • LIBERTYVILLE, ILL.**

SUBSIDIARY INTERNATIONAL HARVESTER COMPANY

**THE FRANK G. HOUGH CO.**

702 Sunnyside Ave., Libertyville, Ill.

Send complete information on the 1955 Model HA "PAYLOADER"

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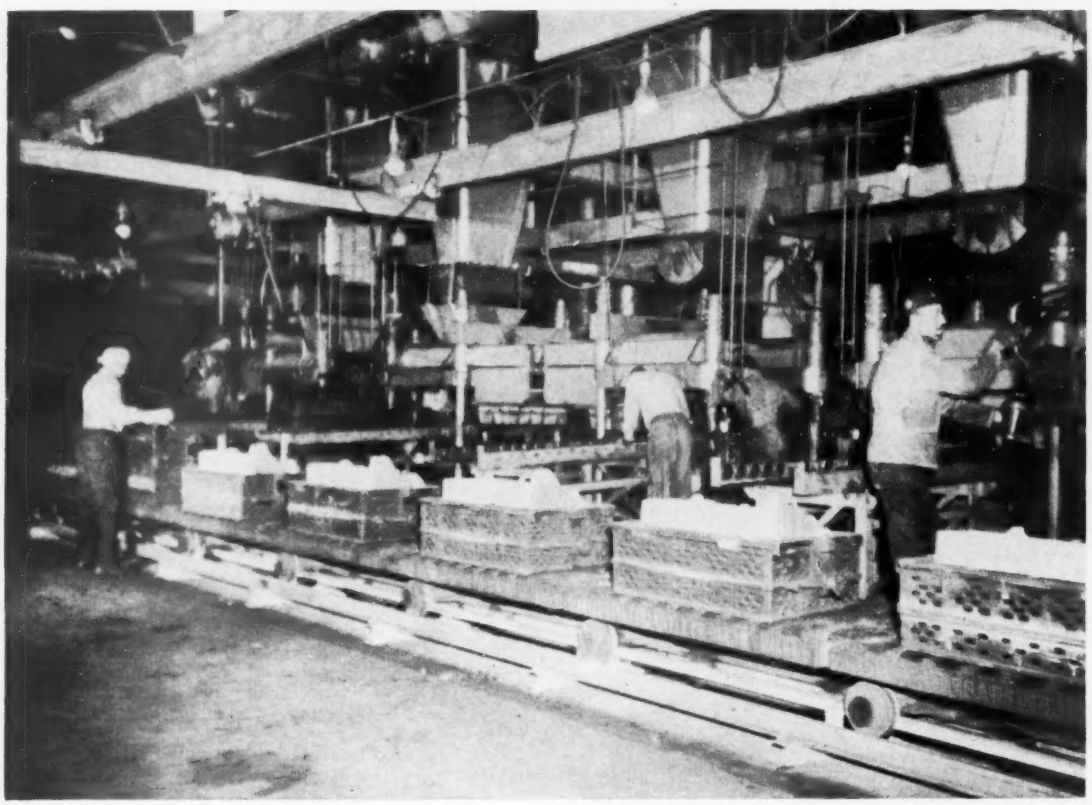
TITLE _____

COMPANY _____

STREET _____

CITY _____ STATE _____

# For 45 Years Manufacturers Have Depended On Nicholls For the Best in Molding Equipment!



A battery of NICHOLLS "push button" automatic molding machines in a large Cleveland foundry.

## The Heavy Duty Molding Machines That Have Everything!

- ***"Push-button" automatic control to eliminate dangerous risks.***
- ***Precision-built for years of service.***
- ***Quality construction for finer molds continuously.***
- ***Fully automatic operation.***
- ***Greater molding economy than you've ever known.***

There must be a reason why so many of the country's top manufacturers choose Nicholls equipment. And there is. It's the same reason why *you* will want to specify Nicholls Jolt-Squeeze and Pattern Draw Molding Machines—Ease and economy of operation, low maintenance costs—and the best possible molds every time.

*For complete information, write:*
*Wm. H. Nicholls Co., Inc., Richmond Hill 18, Long Island, New York.*

# NICHOLLS

## DELTA FOUNDRY PRODUCTS

**CORE AND MOLD WASHES**

*FOR STEEL:*
Delta Special Core and Mold Wash Base
Delta SteelKoat
Delta PyroKoat S

*FOR ALL TYPES OF SAND CAST METALS:*
Delta ThermoKoat
Delta Z-Koat
Delta Z Z-Koat

*FOR GRAY IRON, MALLEABLE, BRONZE AND BRASS:*
Delta GraKoat
Delta BlacKoat
Delta DriKoat

*FOR GRAY IRON:*
Delta BlacKoat S-5

*FOR NON-FERROUS AND LIGHT METALS:*
Delta NonferrusKoat

•

**PARTING COMPOUNDS**
Delta Partex
Delta Liquid Parting

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**MUDDING AND PATCHING COMPOUNDS**
Delta Sliktite
Delta Ebony

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**NO-VEIN COMPOUND**

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**MOLD SURFACE BINDERS — LIQUID**
Delta Spray Binders

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**PERMI-BOND**

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**DRI-BOND**
(Dry Binder)

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**BONDITE BINDER**

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**LIQUID RESINS AND BINDERS**
Delta 155-X Fast-Dri
Delta 168-X Fast-Dri

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**96•B SAND RELEASE AGENT**
**SAND CONDITIONING OIL**

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**CORE ROD DIP OIL**

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**CORE OILS**

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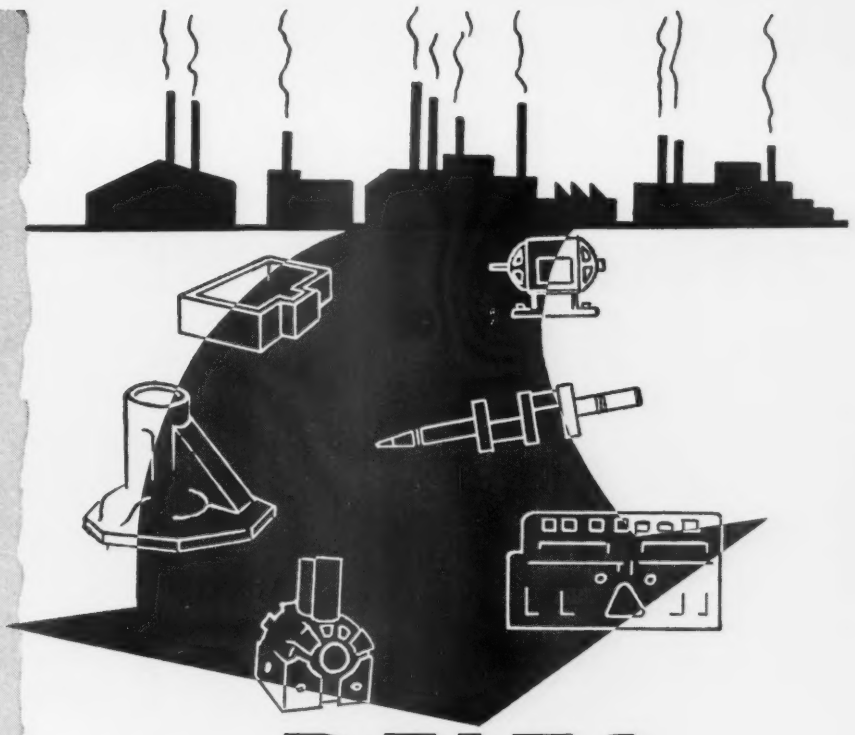
**DELTA-DIETERT PROCESS BINDER 103XX**
(For "D" process shell cores.)



# DELTA

## FOUNDRY PRODUCTS *SPEED* PRODUCTION OF BETTER, CLEANER CASTINGS AT *lower cost*

Every DELTA Foundry Product has been scientifically developed to provide more speed and greater economy in the production of finer-finished castings. DELTA'S scientific control safeguards the higher quality and maintains the absolute uniformity of product so essential to consistently better results.

DELTA

***Get the Facts*** . . . Working samples and complete literature on Delta Foundry Products will be sent to you on request for test purposes in your own foundry.

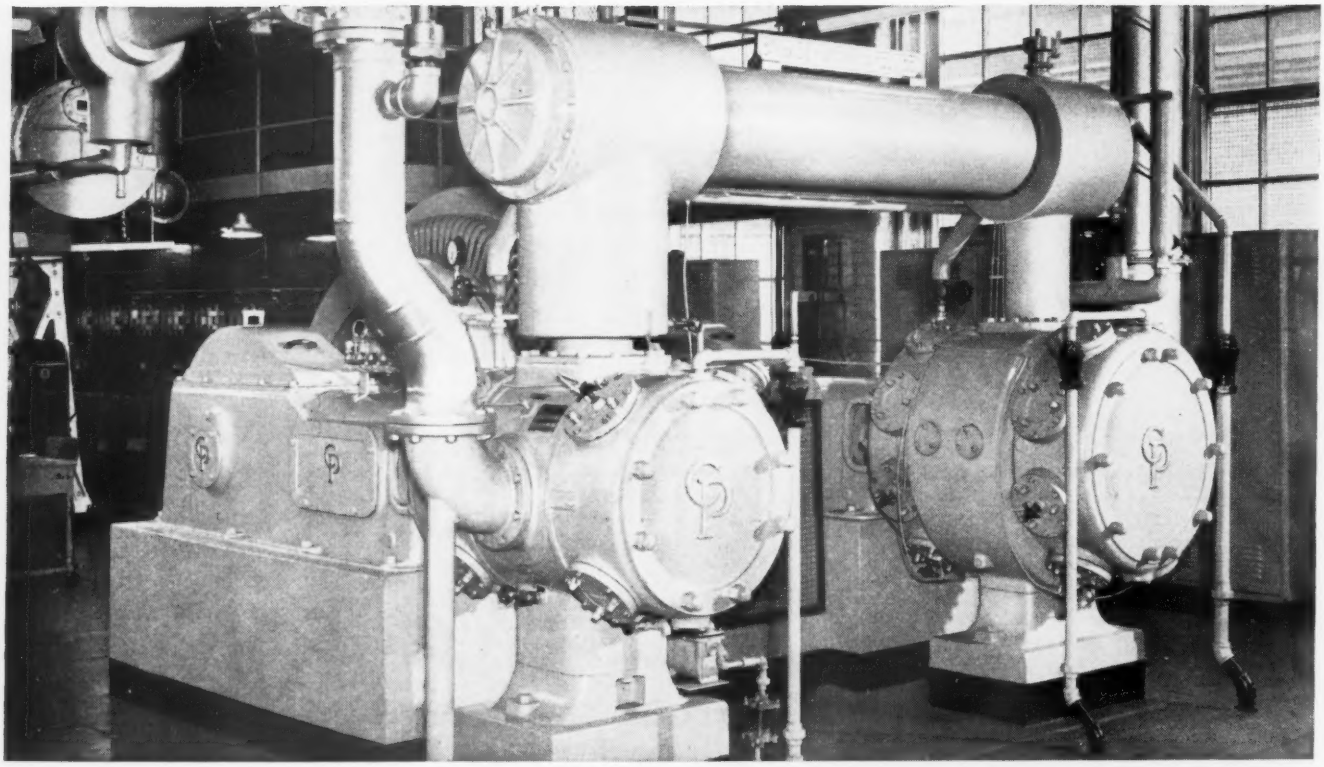
**DELTA OIL PRODUCTS CO.**

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

**MILWAUKEE 9, WISCONSIN**

# this trade mark...

## key to compressor dependability



The dependability of CP's heavy-duty Class O-CE horizontal duplex compressors is reflected in repeat orders. Typical of these is one from a prominent electrical manufacturer: The first CP Compressor in this plant—300 HP size—was installed in 1935 . . . the second—rated 400 HP—was added in 1951. Both operate continuously, with remarkably low upkeep . . . and they should be "going strong" in 1975.

The long life, low upkeep and high efficiency of O-CE Compressors are due to their moderate ratings, Simplate Valves, completely effective and easy-to-clean intercoolers, and their roller main and crankpin bearings. Built in sizes up to 2,000 HP, they're available in single and multi-stage designs, steam and electric drives, for pressures up to 15,000 pounds. For details write *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

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PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

# ART IN IRON

*Old German Ironmasters* in the early 1800's created delicate art treasures such as those pictured above. This art flourished during the Thirty Years' War when other metals were unobtainable and now these trays with their delicate tracery of detail have become museum pieces of real value. Today we move at a faster pace in foundry procedures. Speed, precision, and utility are continually demanded and we have drifted away from the old idea of art for art's sake.

At United we are not artists. All our own skills are centered in making better bonding agents for cores and now for the pay-off, we offer Aqua-set as the fastest, cleanest and most versatile of any time-tested binder in the field. Aqua-set is a resin type binder and when we say it's fast to bake out, we mean really fast. Minutes after cores are dried of moisture with oven heat, they are cured and ready for use. If gas has been a problem then you will want to know that the total gas content of Aqua-set is less than half that developed in a conventional binder.

Would your cleaning room appreciate easier going, then they should know that spent cores, with a tap or two on the casting, pour out like sand. What else is needed in a core binder to recommend its use? Nothing but a moderate cost and here we can ring the bell again. The price tag on Aqua-set makes it a bargain in any language, and for the foundry's special convenience, it is offered in two forms—both as a liquid and a dry binder.

The whole story on Aqua-set makes interesting reading. It contains tests run by authorities in the foundry field and shows in pounds per square inch just what strength you can expect to get in various sand mixes. You will want this folder and it is yours for the asking.

**AQUA-SET**

**A SYNTHETIC CORE BINDER**

**LIQUID OR DRY**

**The fruit bowl and sandwich tray shown above are part of the Lamprecht Collection of Cast Iron Art and are shown through the courtesy of their owner, The American Cast Iron Pipe Company. If you are interested in knowing more about this remarkable collection, please write us for a booklet which describes it in detail and which we will gladly mail to you on request.**

## UNITED OIL MFG. COMPANY

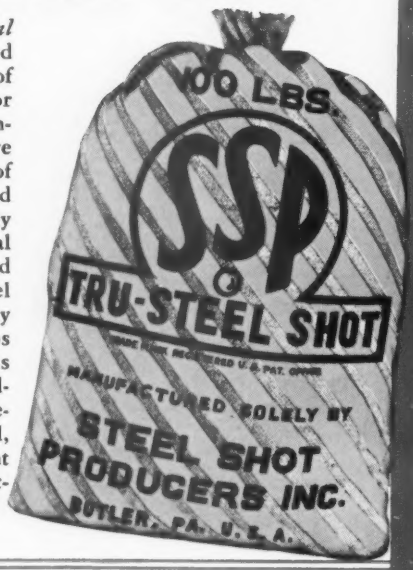
1429 WALNUT STREET, ERIE, PA.

# 4 ORIGINALS—the leading abrasives for blast cleaning!

*Four great names in metal abrasives stand alone in dominant leadership—all products of continuing research in development of better abrasives by America's pioneer maker of metal abrasives, Pittsburgh Crushed Steel Company and subsidiaries.*

## TRU-STEEL SHOT

Tru-Steel is the *original* super-tough, heat-treated and drawn steel shot of tool steel quality, for those cleaning and peening applications where the savings potential of its performance and longer life can be fully utilized. In such typical jobs as steel sheet and strip blasting, Tru-Steel provides an absolutely *clean* surface. Many jobs where blast cleaning has heretofore been considered impossible are being done with Tru-Steel, resulting in important savings in big-production blast cleaning.




## MALLEABRASIVE®*

Malleabrasive is the *original* patented malleablized metal abrasive and the most widely used premium abrasive. Intermediately priced, Malleabrasive provides lower overall blast cleaning costs in more varying types of blast cleaning conditions than any other metal abrasive. Malleabrasive has been widely imitated, but genuine Malleabrasive is manufactured under the complete Malleabrasive process used by our organization only, providing Malleabrasive's unique and distinctive metallurgical structure.

*U.S. Pat. #2184926 (other patents pending)

## "SAMSON" SHOT—"ANGULAR" GRIT

These are the *original* metal abrasives, the oldest and most famous names in metal abrasives . . . the products that led the conversion of foundries from the use of sand to metal abrasives for blast cleaning at the turn of the century. These are not ordinary chilled iron abrasives, but products of modern, unequalled manufacturing facilities, geared for production of metallurgically controlled abrasives of uniform chemistry, hardness and toughness. For operations requiring chilled iron abrasives, these are the *top leaders.*

**LET US** help you determine the type of metal abrasive most efficient and economical for your needs. 5 manufacturing plants, 13 distributing points, 33 sales and service branches at your disposal. Write us.

**PITTSBURGH CRUSHED STEEL CO., Arsenal Station, Pittsburgh 1, Pa.**

# DUST CONTROL DIARY *TELLS ALL!*

## Get Your Free Copy of Jobbing Foundry's Detailed Report on 8 Years of ROTO-CLONE Dust Control

HERE'S a complete report on a medium sized steel foundry's "all out" effort (and success) in controlling dust both within and without their plant. It covers every foundry operation from electric furnace to swing frame grinding—tells how, with aid of 16 AAF ROTO-CLONES, they are collecting all but 21 lbs. of the 746 lb. total hourly dust load. Every factor is carefully analyzed—even to the detailing of ROTO-CLONE repair costs, which amount to only $382.00 for the 16 units over the 8 year period.

If you are interested in making dust control a real force in improving working conditions and community relations, you'll find this report most helpful. Just fill out and mail the coupon for your free copy. It's yours without obligation.

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I would appreciate receiving free copy of "A Case History of Dust Control Performance"

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Company_____

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# *Vigorous* VIBRATION for Maximum Loads

**When you specify** *Foundromatic* shakeout, you don't have to buy extra capacity to get adequate vibration under rated loads. This shakeout weighs more than 40% of its rated capacity — an *extra* reserve of weight that assures rapid shakeout on even the heaviest castings or flasks.

Along with the extra weight that slashes knockout time, the *Foundromatic* shakeout has rugged construction that means steady operation. Free-floating shakeout body, including heavy reinforced deck supports and converging sand discharge hopper, is a sturdy one-piece unit. Entire structure is stress relieved after welding to provide maximum resistance to shock impact loads. Heavy flat deck minimizes flask damage. Simplified, two-bearing mechanism is not affected by overloads . . . requires less maintenance. Oversized bearings provide extra long and dependable service.

For complete information, see your A-C representative or write Allis-Chalmers, Milwaukee 1, Wis. Ask for Bulletin 07B6365B.

## "FOUNDROMATIC" SHAKEOUTS

## Smooth Stopping

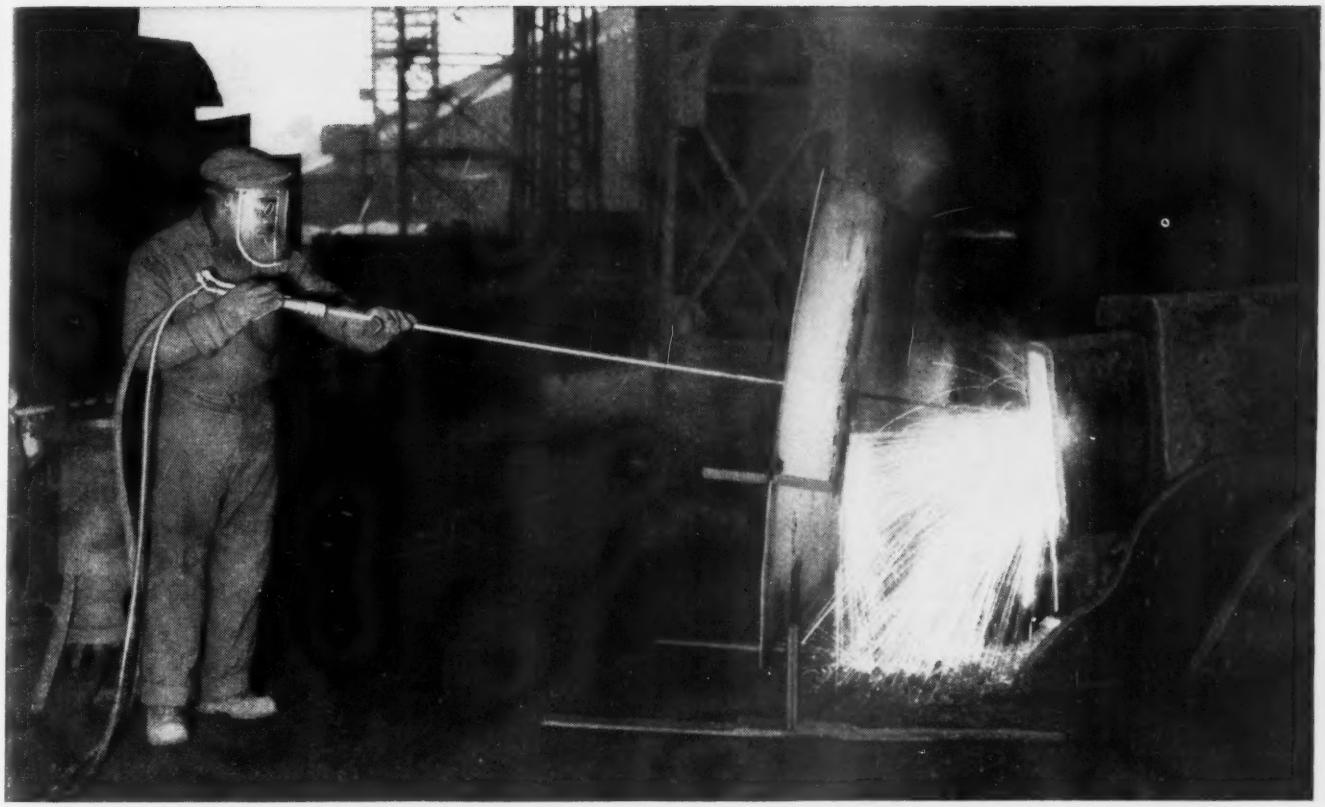
**New control replaces friction checks.** The patented Allis-Chalmers stop control for *Foundromatic* shakeouts eliminates stopping bounce and excessive friction check maintenance. This control reverses the torque of driving motor after speed has been reduced. With the motor torque opposing the rotation of the mechanism, the shakeout is brought to a stop *before* amplitude builds up.

Because there is no excessive bounce, castings and flasks are not damaged, crane hitches remain in place . . . motor and drive last longer. Send for Bulletin 07B8141.

*Foundromatic* is an Allis-Chalmers trademark.

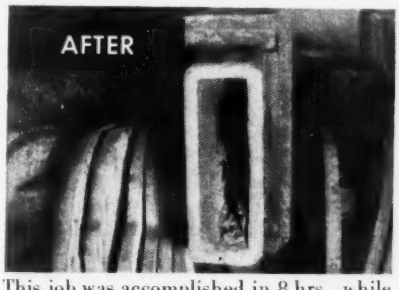
**ALLIS-CHALMERS**

A-4625



# Cut Mold Core Cleaning Time 2/3 by Powder-Lancing

Typical conditions of splashed metal, sand, and slag which have penetrated this ingot mold core.




This job was accomplished in 8 hrs., while previous lancing methods required up to 30 hours.

The time required to clean away splashed metal, sand, and slag which have penetrated these ingot mold cores has been cut from 30-hrs. to 8 by powder-lancing.

The speed of powder-lancing enables a steel mill to cut labor costs by more than ⅔, and reduce the consumption of lance pipe to less than ½ that ordinarily required.

In powder-lancing, a powdered metal is added to the oxygen lance process which raises its "flame" temperature, and increases the rate of melting or oxidation in the material being lanced.

A powder-lance can pierce holes in many materials that resist a standard oxygen lance. Blast furnace refractory, concrete, cinder blocks, fire brick, aluminum billets, steel and cast iron containing inclusions, and sand and metal incrustations—all yield quickly and easily to powder-lancing.

Powder-lancing is helping to speed production and maintenance in mills throughout the country. LINDE service engineers will be glad to help you determine the latest, most efficient setups for any lance operation. Call your local LINDE representative for more information. Save time and money, call him today.

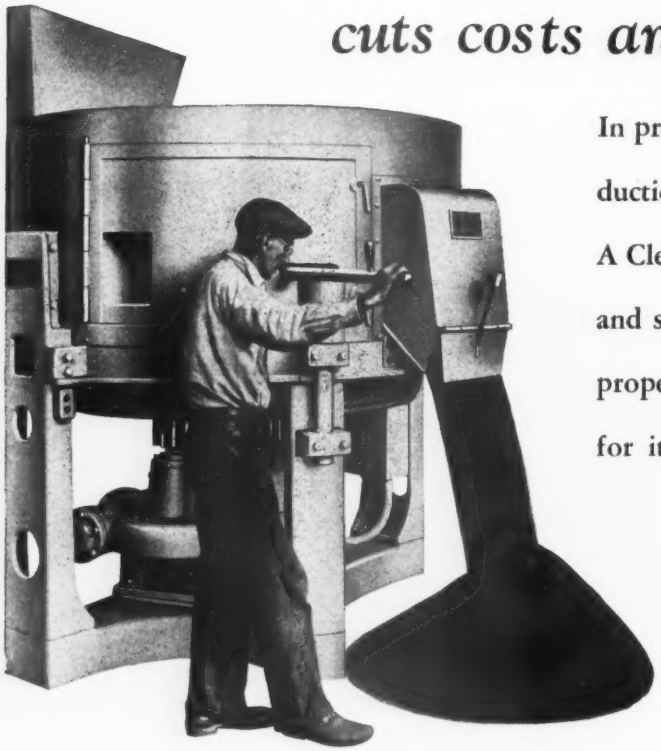
**LINDE AIR PRODUCTS COMPANY**
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York, 17, N. Y.
Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY
Division of Union Carbide Canada Limited, Toronto

Linde Trade-Mark

"Linde" is a registered trade-mark of Union Carbide and Carbon Corporation.

# the *Clearfield* mixer

## *cuts costs and speeds production*



In preparing foundry sand, if you can speed production and maintain high quality *you cut costs.* A Clearfield Mixer, with its speed, dependability and special mixing features, prepares your sand properly and exactly as you want it, thus paying for itself many times over.

Write today for Catalog No. 83. Clearfield Mixers are available in many sizes to meet every need.

CLEARFIELD
MIXER

*fast,*
*thorough*
*sand preparation*

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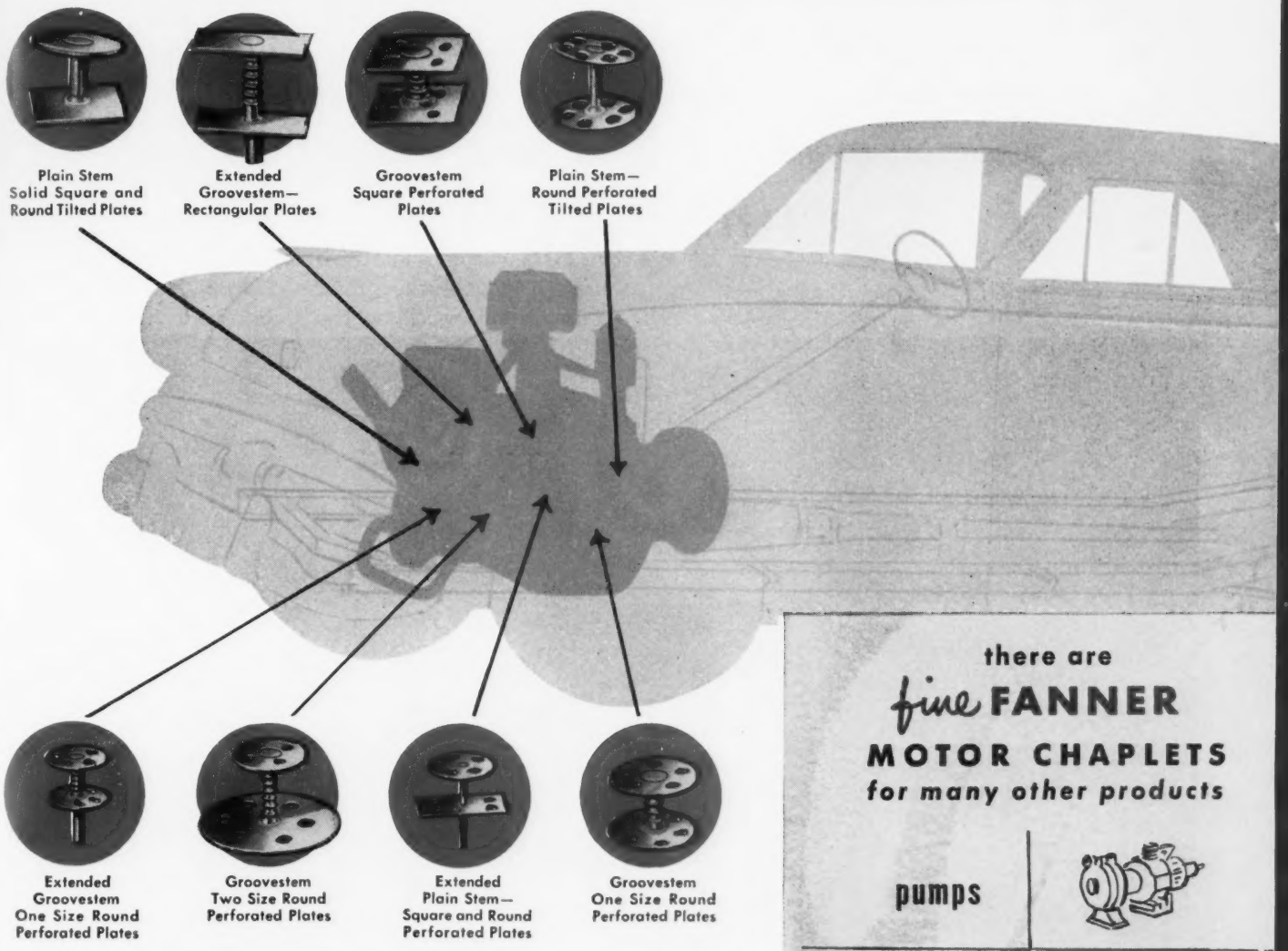
# fine FANNER motor CHAPLETS

***are used by more automotive manufacturers . . . in more locations . . . because of their outstanding record for producing sound, uniform castings***




**Products that are used by automobile manufacturers must pass the most rigid of tests. This is especially true of products involved in the casting operation because this industry depends on a gigantic continuous flow of uniform sound castings which form the heart of every motor car. Here, there can be no compromise with quality because unsound castings mean product failure and production line breakdowns. It is significant that for the past 30 years more fine Fanner Motor Chaplets have been used by more automotive manufacturers for more different castings than all other types combined. The millions upon millions of fine Fanner Motor Chaplets that have become an integral part of almost every motor car manufactured in the United States are proof of the close precision tolerances maintained, and the uniform high quality of these Fanner products. Fine Fanner Motor Chaplets through their exclusive design, their positive core support, their accuracy of construction, their complete fusion help produce better castings . . . at lower costs . . . with fewer losses . . . yet they cost no more! Only a few of the wide range of Motor Chaplets made by Fanner are shown —get acquainted with the complete line of Fine Fanner Chaplets by writing today for your free copy of the Fanner Chaplet Catalog.**

**THE FANNER MANUFACTURING COMPANY**

*designers and manufacturers of fine FANNER CHAPLETS AND CHILLS*

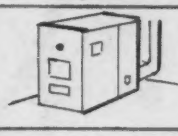
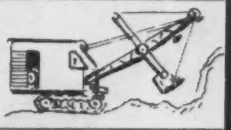
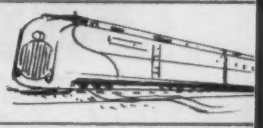
**BROOKSIDE PARK** **CLEVELAND 9, OHIO**

there are

*fine* **FANNER**

**MOTOR CHAPLETS**

***for many other products***

| | |
|---|---|
| **pumps** |  |
| **stoves** | |
| **furnaces** |  |
| **road machinery** |  |
| **locomotives** |  |
| **farm machinery** | |

# 3 Great Wheels for Non-Ferrous Grinding

***Norton ALUNDUM* resinoid, CRYSTOLON* vitrified and BN wheels cover a wide range of soft-metal applications . . . adding the profit-boosting***

## "TOUCH of GOLD"

***A Norton ALUNDUM Resinoid Wheel,*** rough grinding aluminum castings, has the fast cutting action and long wheel life that add up to the ideal grinding quality for applications on this metal.

The most reliable way you can gauge any grinding wheel's value is by its *grinding quality* — the factor which takes into consideration *both* wheel cost and labor cost.

Continuous research and testing by Norton, together with many job-reports from non-ferrous foundries, prove that for three important types of soft-metal grinding there are three types of Norton wheels with exactly the right grinding quality to provide best performance at lowest cost. As follows:

**For Grinding Aluminum,** Norton ALUNDUM resinoid wheels offer the abrasive-and-bond combination that means fastest, coolest cutting action plus longest wheel life.

**For Grinding Bronze and Brass,** Norton CRYSTOLON vitrified wheels wear at just the right rate to assure the grinding quality that means more grinding for less money.

**For Cutting-Off and Notching** gates and risers, Norton BN reinforced resinoid wheels combine unusually high resistance to breakage with fast cutting action and long wheel life.

### *Your Norton Distributor*

will be glad to help you select wheels that will add the cost-cutting, product-improving "Touch of Gold" to every grinding job, on every material and every type of machine. And remember: only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. Write for booklet "Rough Grinding" to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

*Making better products. . . to make other products better*

***A Norton CRYSTOLON Vitrified Wheel*** combines the abrasive and bond that make grinding this bronze worm-gear casting an easier, more economical job. There's no better wheel for grinding brass and bronze on any type of machine.

***A Norton BN Reinforced Resinoid Wheel*** is not only useful for cutting-off and notching gates and risers but for light snagging and many other jobs. It's one of industry's safest, longest-lasting cut-off wheels.

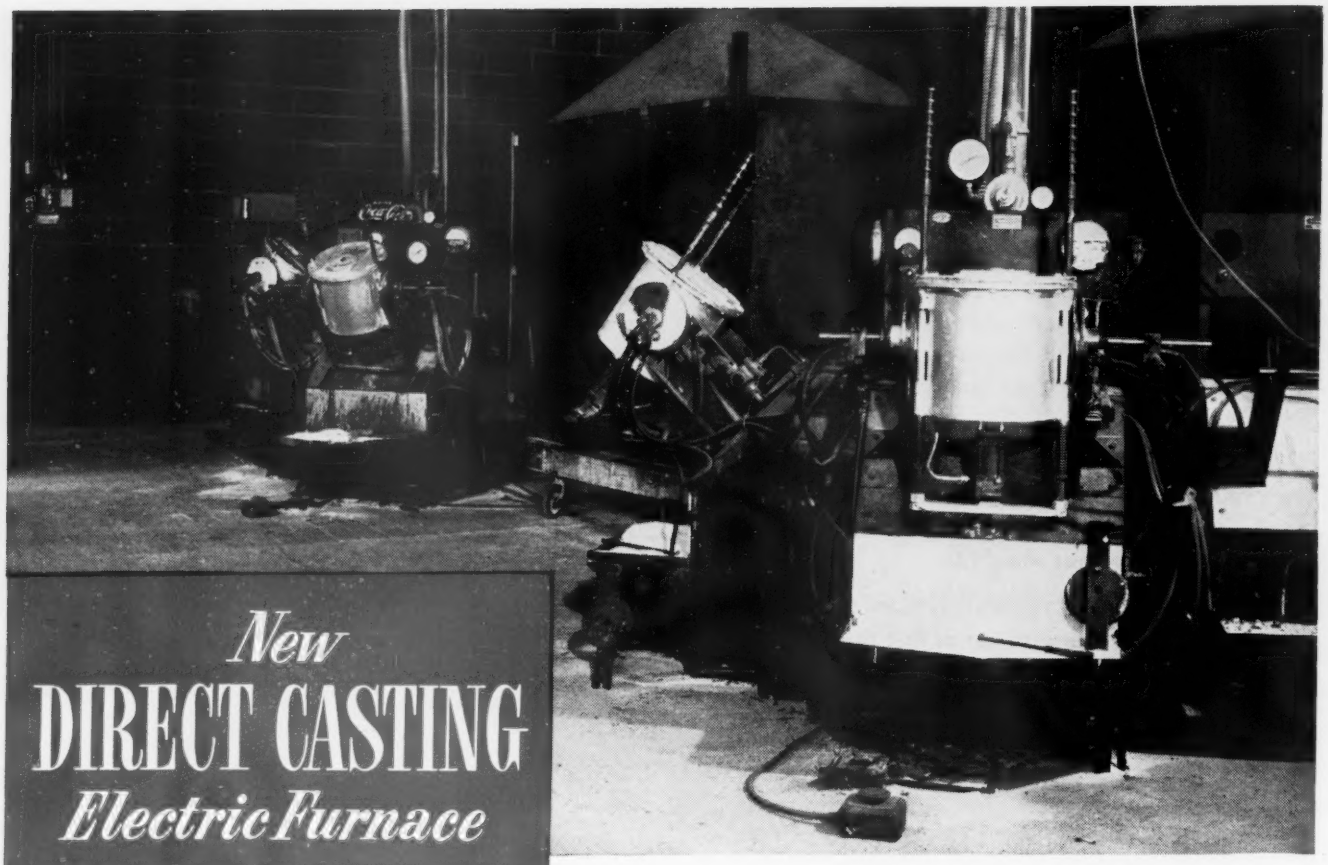
**NORTON**

*and its* **BEHR-MANNING** *division*

NORTON Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

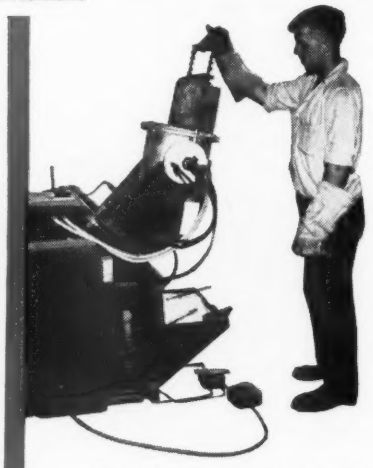
*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

W-1591



# *New* DIRECT CASTING *Electric Furnace*

***Above:*** Battery of Detroit IC Furnaces in precision casting foundry.
***Below:*** Workman ready to invert furnace for casting into attached investment.



## Detroit Electric Furnace Produces 6-lb. Investment Castings In 7-13 Minutes *All Day Long*

This new Detroit Electric Furnace is designed for better, faster investment casting. There's no pouring, ladling or handling of molten metal. You get fast melting *plus* direct furnace-to-mold casting in one easy operation. Just charge and melt—when ready for casting, invert the furnace and pour directly into attached investment. Detach the mold and you're ready to repeat the cycle—in 7 to 13 minutes.*

Fast, controlled melting by indirect arc holds alloy variation and carbon pick-up to a minimum. Low power consumption, high utilization of heat promotes operating economy. Uniform results through melt after melt mean fewer rejected castings, greater over-all efficiency.

Investigate the advantages of this new high-production furnace for investment casting. Write today for details on the Type IC Detroit Electric Furnace.

*Typical Melting-Casting Data for Type IC-12KW, 10-lb. Detroit Electric Furnace.

| Metal | Weight Charge | Over-all Melt-Cast Cycle | Power Consumption |
|---|---|---|---|
| Stainless Steel | 6 lb. | 13 Min. | .364 KW/lb. |
| Stellite | 5¾ lb. | 12 Min. | .340 KW/lb. |
| Gray Iron | 6 lb. | 12 Min. | .333 KW/lb. |
| Copper | 6 lb. | 8½ Min. | .203 KW/lb. |
| Yellow Brass | 6 lb. | 7½ Min. | .179 KW/lb. |

Faster Heats
Better Metal ROCKING action does it

**DETROIT ELECTRIC FURNACE DIVISION**

Kuhlman Electric Company • Bay City, Michigan

Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N.Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D. F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.

# really NEW... ... FOR PORTABLE GRINDERS

"GRINDAWAY*" wheels with SAFETY RINGS which grind away

## . . . they assure you of increased safety, because they reduce the danger of "bursting"

If you have ever been around when a grinding wheel "explodes", you know what can (and often does) happen . . . it's not only frightening, but can be very dangerous.

But now, we of Colonial, have, after many years of grinding wheel experience, developed the "GRINDAWAY" reinforced resinoid high speed wheel for portable grinding. This wheel not only offers a greatly *increased safety factor*, but in addition, is the same high quality wheel that Colonial has always manufactured.

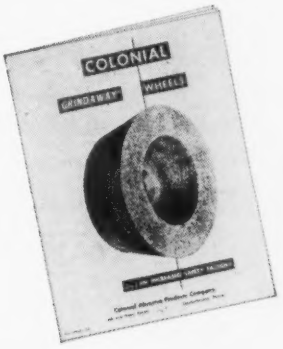
The "exclusive" feature of this new wheel is the reinforced rings, which have a higher Tensile strength than steel . . . and, these rings are inserted right where the reinforcement is needed: in the actual grinding portion of the wheel . . . this is only made possible, because they abrade away as the wheel wears through them.

Colonial offers "GRINDAWAY" Safety Wheels in three types: straight, recessed, and flaring cup . . . all available *without any premium cost.*

Of course, Colonial continues to offer industry a complete line of regular Vitrified and Resinoid wheels for every grinding need, plus their personalized grinding wheel Engineering Service.

Write, wire or phone Colonial today regarding your grinding problems . . . You will receive prompt, courteous attention and worth-while advice.

*Patent applied for




FREE LITERATURE UPON REQUEST

NOTE: In testing laboratories GRINDAWAY Wheels have been purposely cracked, and then run at speeds considerably higher than normal operating speeds "without bursting"

**COLONIAL ABRASIVE PRODUCTS CO.**
SIXTH AND HARRY STREETS
CONSHOHOCKEN PENNSYLVANIA

# Every Crack Has a Cause!

## Inspection with MAGNAFLUX* at the *RIGHT* times

- Finds the Cause
- Suggests the Remedy
- Reduces Rejects
- SAVES YOU MONEY
- BUILDS NEW BUSINESS

Crack as revealed by Magnaflux in the end-bell casting on an electric motor. Crack is the result of improper handling.

Not *all* cracks are serious. It depends upon the type, size and location. But in the few areas where stress is high, even a tiny crack can be important, because it raises the stress still further.

The *right* time to find cracks is when they *first* occur. This may be anywhere from pilot run to handling for shipping. Wherever it is, sampling inspection with Magnaflux finds and clearly marks the defect to point to the cause.

By finding serious defects early in processing, you can determine *where* they occur and how to correct them — before parts are run in quantity and later rejected. Correction often involves only a minor change in design or feeding procedure, or in cleaning or handling, with each change checked by Magnaflux in pilot runs. This results in a production run with almost no rejection due to cracks. It leads to castings with even stress flow, that are cheaper to pour, lighter, stronger and better looking.

With RELIABLE castings cheap to make, many foundries that use inspection with Magnaflux are now selling castings where formerly more costly forgings and weldments were used.

Find out now how inspection with Magnaflux can help you produce better castings, at lower cost to a bigger market! Ask to have a Magnaflux Engineer call and give you the facts.

*Magnaflux is a Registered Trademark of Magnaflux Corporation

**MAGNAFLUX**

**MAGNAFLUX CORPORATION**

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New York 36 • Pittsburgh 36 • Cleveland 15
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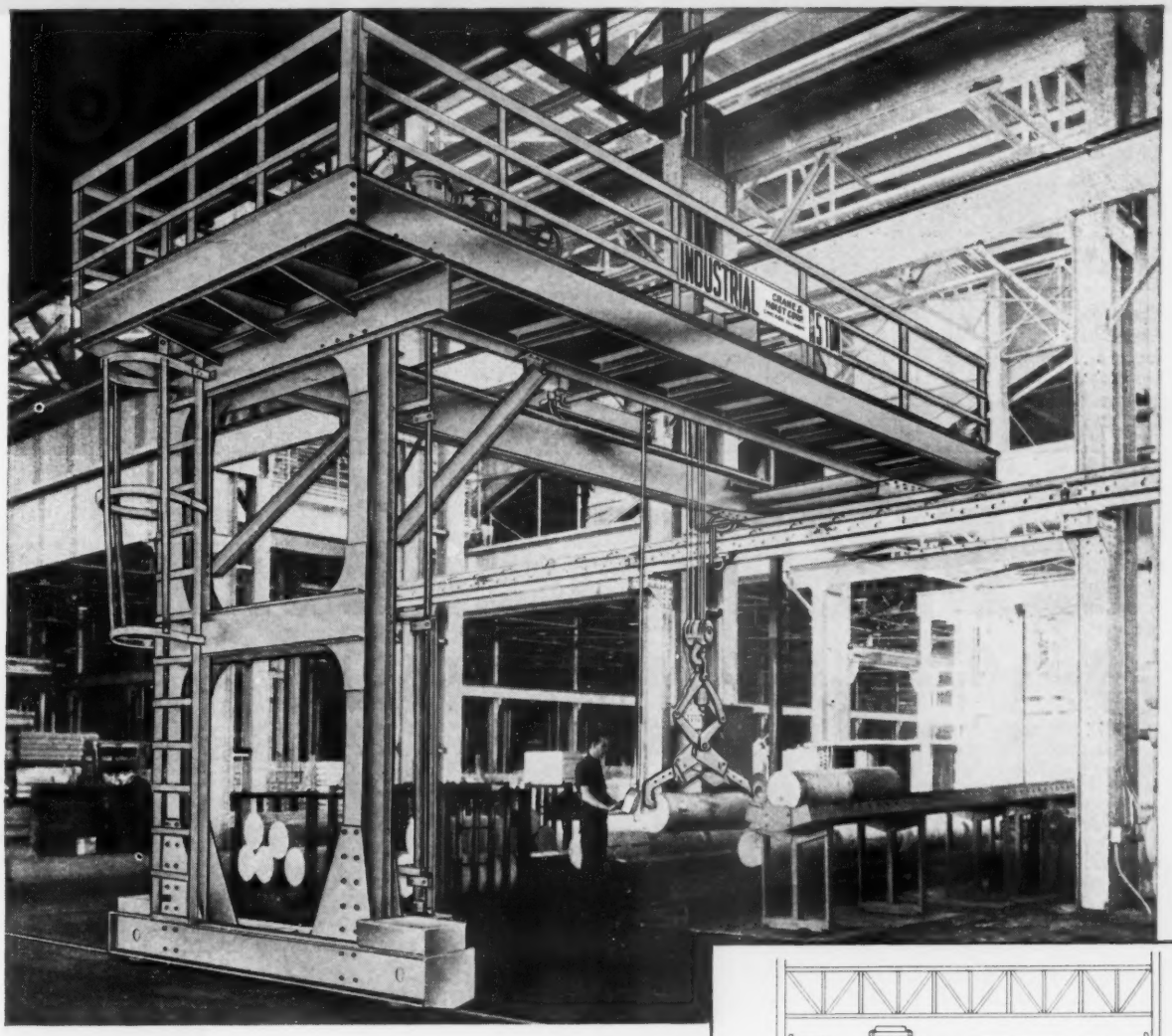
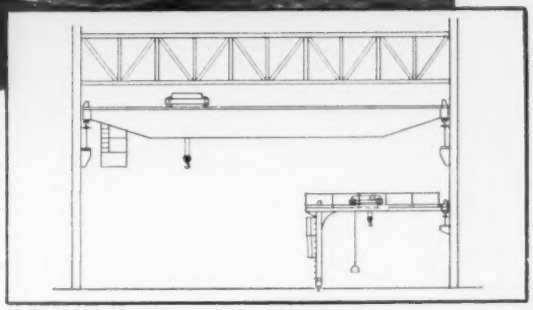
# Industrial SEMI-GANTRYS SPEED BILLET HANDLING



The diagram illustrates the relative positions of the Industrial Semi-Gantry and the heavy capacity overhead crane, both of which operate without interfering with each other.

Industrial CRANES

An Industrial motorized Semi-Gantry does a production job handling billets from racks to a conveyor in a large metal plant.

Serving a local area in the factory the Industrial Semi-Gantry operates on its own runway—freeing the heavy capacity overhead crane for other important jobs, resulting in overall savings in operation and maintenance.

Consult with Industrial Crane & Hoist Corporation for an economical solution to your materials handling problems.

## INDUSTRIAL CRANE & HOIST CORPORATION

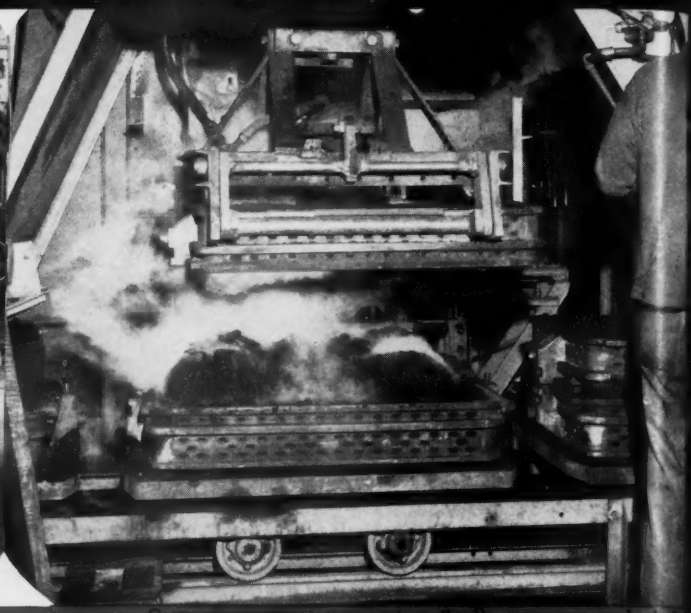
**1541 SOUTH PAULINA STREET** **CHICAGO 8, ILLINOIS**

***Overhead Cranes • Jib Cranes • Monorail Systems • Crane Runways***

***Representatives in Principal Cities***

SG 1054 C

1 Cope and drag are joined at this point on the Automatic Car Conveyor Line. Flasks shown are 28" x 40". In right background molds are continuous poured as they travel by on the conveyor. An average of 70 tons of cast iron is poured each shift. Castings vary in weight from 8 to 140 lbs. and are used in the automotive and tool industries.



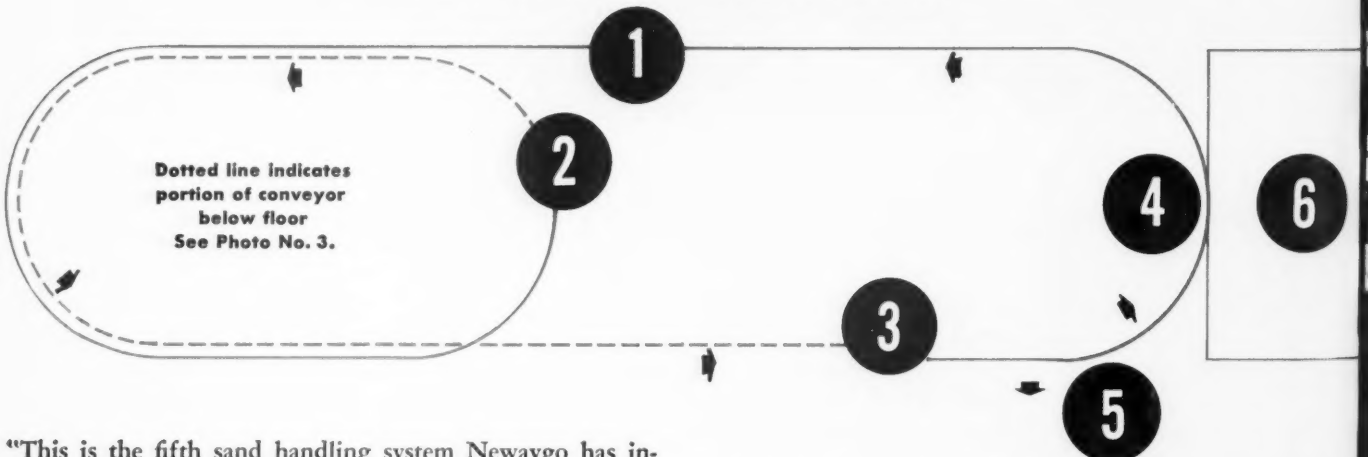
2 Cope [illegible] station automatically removes and shak[es] out cope section of the flask; then returns it to the A[uto]matic Cope Molding Machine.

Note the rugged, durable construction of the Newaygo C[ar] Conveyors. They are actually built twice as strong [as] necessary to withstand the hard wear they are subject [to] without breaking down.

# NEWAYGO ENGINEERS AF[ULL]

## ENTIRE AUTOMATIC MOLDING SYSTEM CONTAINED IN AN AREA 165' x 50' AT CENTRAL SPECIALTY DIV.

YPSILANTI, MICHIGAN



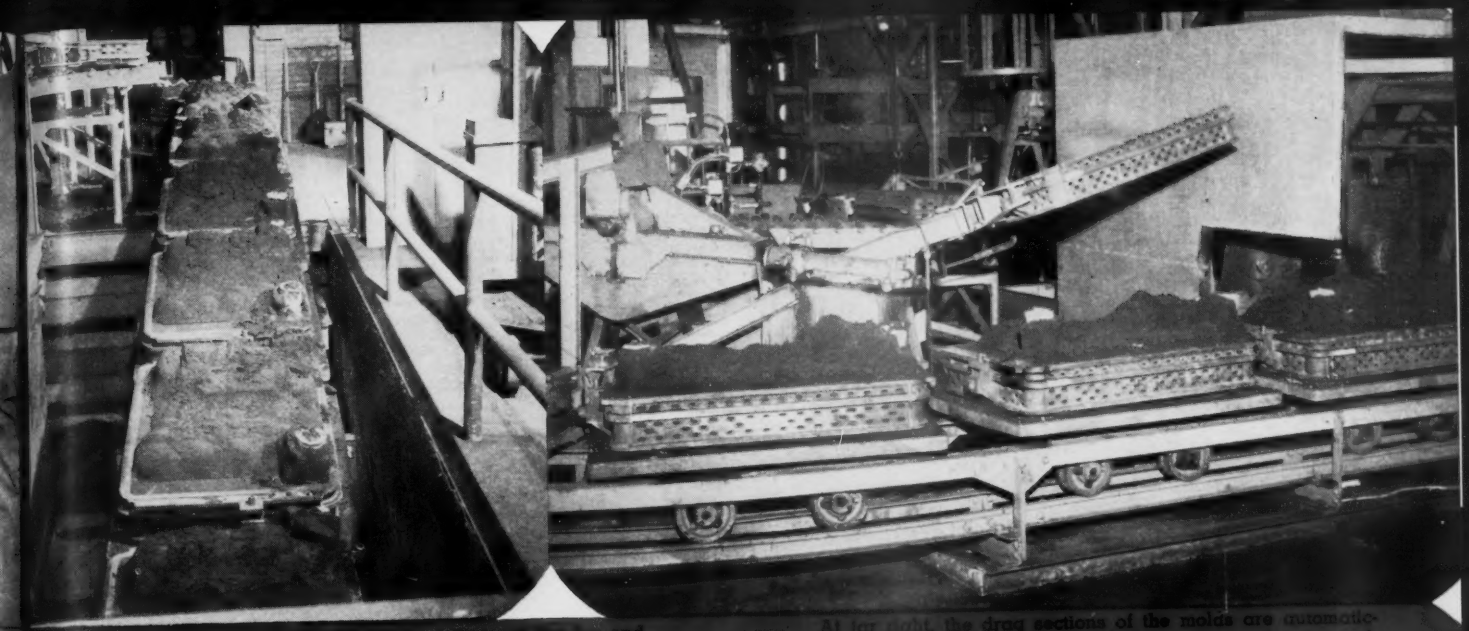

"This is the fifth sand handling system Newaygo has installed for Central Specialty Division in a period of 25 years. On this particular job we were looking for engineering ability, heavy duty specifications plus follow-through and attention to job details. Newaygo filled these requirements. Also in anticipation of longer equipment life, all bins, chutes and hopper are lined with Stainclad Steel.

"This extremely compact system has been running less than a year and is shaping up very successfully. Labor's acceptance has been good. Fatigue and sand shoveling have decreased 80%."

**NEWAYGO** | engineering company
NEWAYGO, MICHIGAN

*Manufacturers of Neway® Mold Handling, Sand Handling and Conditioning Equipment*

*A Copy of "Planned Mechanization for Foundries" is yours for the asking. Write, wire or phone today.*



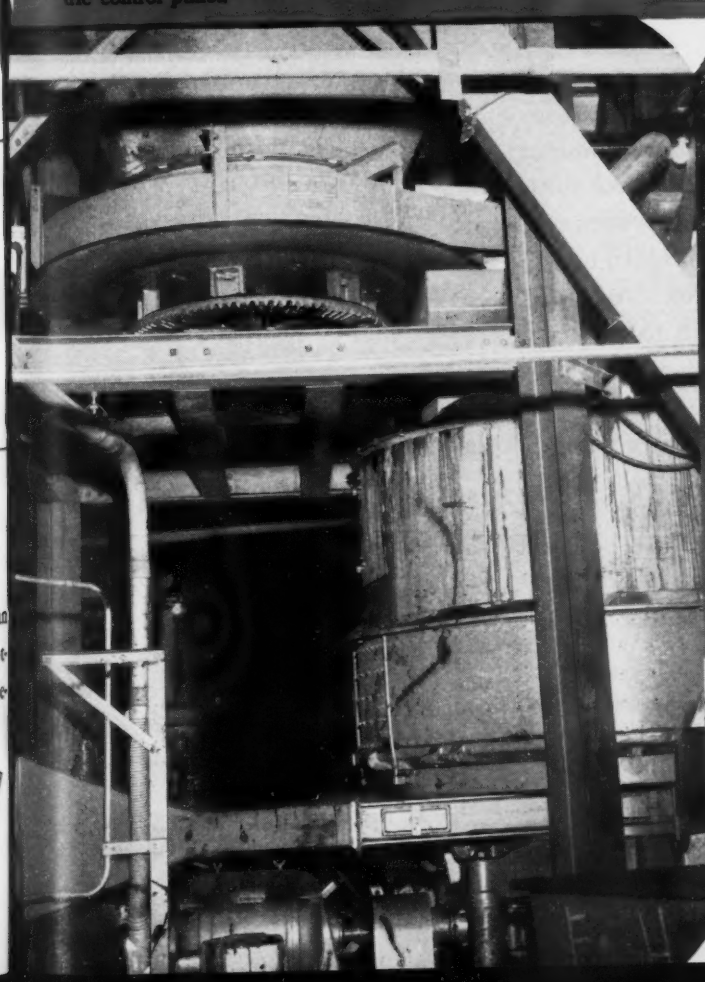
3 After pouring, molds travel in a semi-circle at the far end of the Automatic Car Conveyor Line to the Cope Shakeout Station (photo #2). They are next conveyed down into a pit for further cooling. Moving continuously, the drag section of the mold with casting is shown coming up out of the cooling pit prior to moving into the Automatic Drag Shakeout Station.

4 At far right, the drag sections of the molds are automatically removed from conveyor, tipped up for casting removal, and shaken out. After shakeout the drag is ejected automatically from shakeout to an Automatic Drag Tip Over Unit. Drag Flasks are picked up (see photo) by a hydraulically activated arm and turned over on a wheel conveyor where they automatically re-enter the drag machine.

# A FOUNDRY WITHIN A FOUNDRY

6 Showing part of the 90 ton per hour Sand Mixing and Storage System installed by Newaygo. The Rotary Plate Feeder distributes sand on an overhead belt system to the two Automatic Molding units. Throughout the entire cycle sand is handled and distributed automatically through an electric control panel.

5 From the Drag Shakeout Station, castings are conveyed under the molding floor. Here they travel on an oscillating type conveyor to a casting sorting apron in another part of the foundry where they are sorted into tote boxes.



# HOW TO BUY PORTABLE WHEELS

## FOR MORE OUTPUT PER MAN-HOUR

### *"More Use per Dollar"*

Look for a company that will engineer wheels specially to meet *your* specific requirements . . . to remove *more* metal, *faster*—at lower cost. Be sure that each type—flared cup, cone or plug and mounted points, as well as straight wheel—is bonded for its particular application and speed.

Select only the most efficient portable wheel for *your* job . . . one that combines fast cutting action with long wheel life. The type of abrasive and correct grain size should be determined by the rate of metal removal and finish your operations require. Only the right rubber or resinoid bond permits the cutting grains to do a uniform quality job at top speed. A careful analysis of these factors as they affect *your* snagging problems can best assure more pieces done per hour with your portable grinders . . . less operator fatigue and lower production costs at your plant.

Specify by name the portable snagging wheels engineered with *your* job in mind . . . specify Manhattan Portable Wheels.

## MANHATTAN PORTABLE WHEELS

Individual engineering for every customer is the secret of success in Manhattan Portable Wheels for portable grinders. Every phase of the wheel you buy—type of abrasive, grain size, hardness, structure and bond—are determined by the specific requirements of your work. They are built to solve the problems at your plant . . . to remove more metal . . . faster . . . at low cost. They satisfy workers on incentive who want speed, as well as management men who want uniform quality production.

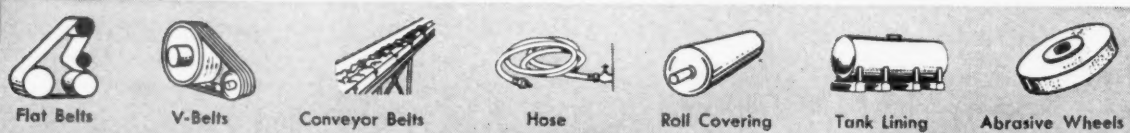
Let a Manhattan representative show you how you can get more output per man-hour and lower production costs . . . "More Use per Dollar" . . . with Manhattan Portable Wheels and other types of high speed, heavy duty abrasive wheels.

RM-542

WRITE TO ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

## RAYBESTOS-MANHATTAN, INC.

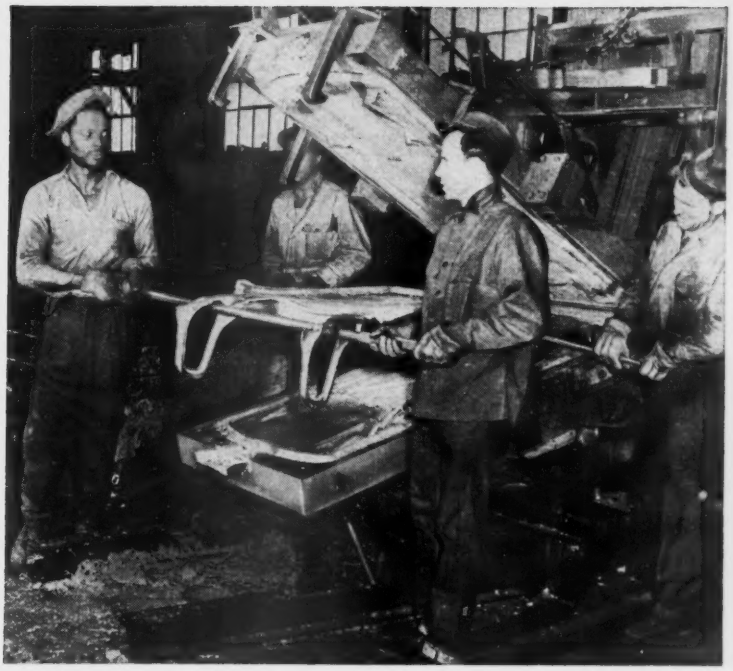


Flat Belts · V-Belts · Conveyor Belts · Hose · Roll Covering · Tank Lining · Abrasive Wheels

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls

*use 'dag' dry films for trouble-free lubrication*

**dag**
**DISPERSIONS®**



Coat your molds with 'dag' Colloidal Graphite to get superior reproduction and smoother casting surfaces. Rejects are fewer; inspection time reduced.

The heat-resistant, low-friction, *dry lubricating film* provided by 'dag' dispersions improves parting and prevents damage to molds and castings. Clean separation reduces time-wasting preliminary finishing operations on the product. And because Acheson's exclusive process makes the graphite particles of 'dag' Colloidal Graphite microscopically fine, the film left on the mold does not measurably alter dimensions of the casting.

'dag' Colloidal Graphite, dispersed in many carriers, can be used profitably to coat permanent molds, patterns, flask pins, shoulder screws, ladle interiors, chills, etc. You'll find a surprising number of ways to use 'dag' dispersions described in our free booklets on 'dag' Colloidal Graphite in the foundry, and 'dag' Colloidal Graphite as a parting compound. Write for Bulletins No. 425-W11 and No. 427-W11.

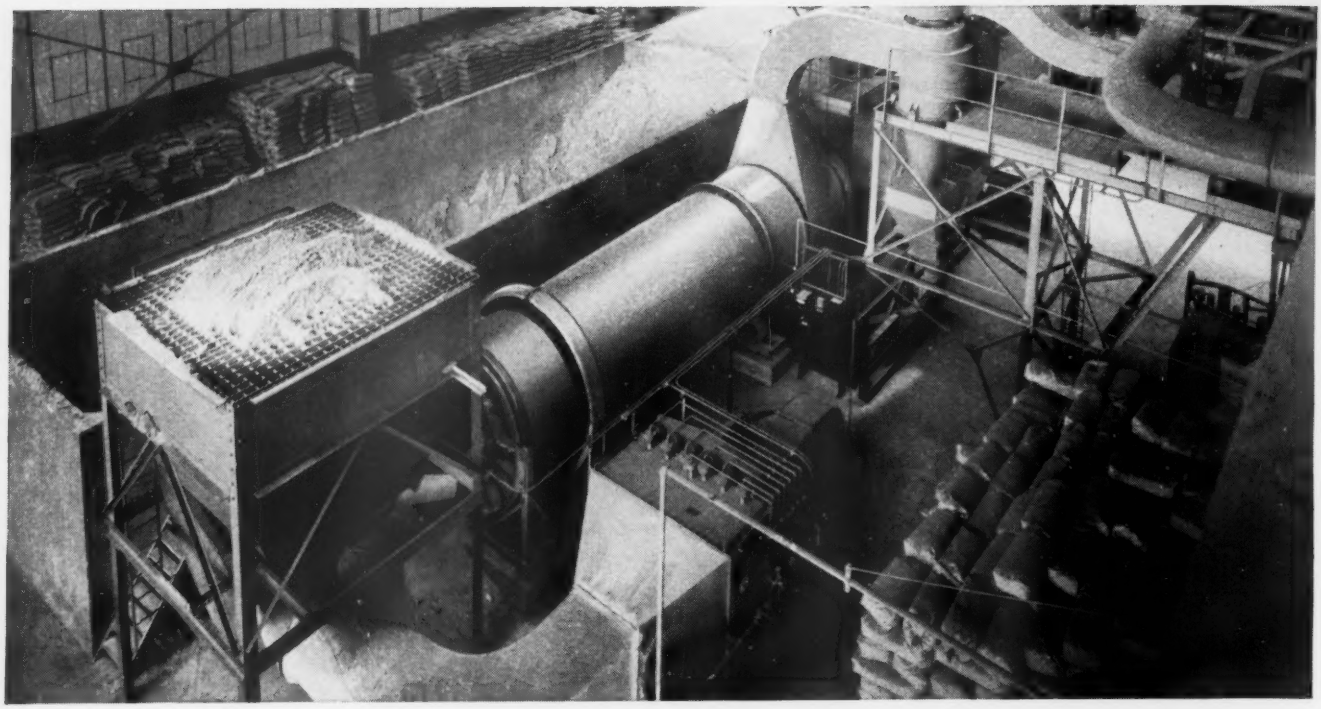
***You can cut casting rejects and inspection time***

**Dispersions of molybdenum disulfide are available in various carriers. We are also equipped to do custom dispersing of solids in a wide variety of carriers.**

**ACHESON COLLOIDS COMPANY**

**PORT HURON, MICHIGAN**

**...also ACHESON COLLOIDS LIMITED, LONDON, ENGLAND**



Link-Belt Roto-Louvre dryer above handles 15 tph of sand at large midwest foundry. Sand is delivered from dump hopper to dryer by 16-in. screw feeder. Heated input air is supplied by gas-fired furnace in foreground.

# DRY MORE SAND IN LESS SPACE

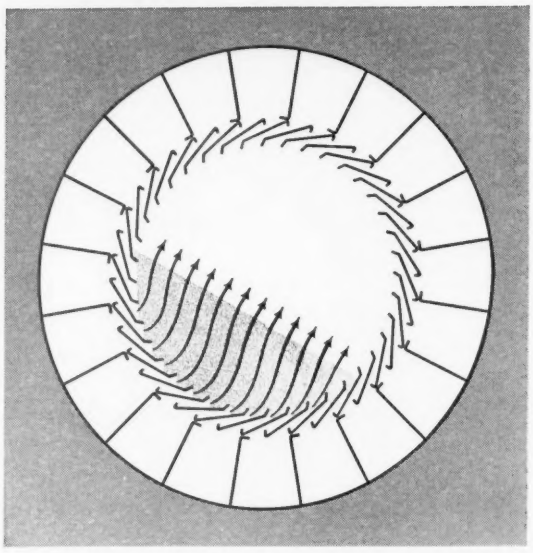
## LINK-BELT Roto-Louvre Dryers deliver cool, uniformly dried sand that gives you better castings

YOU can't produce top quality castings unless you use sufficiently cooled, dry sand. And many foundries have discovered the low-cost answer to needed capacity in the Link-Belt Roto-Louvre Dryer utilizing *controlled* high temperatures.

Roto-Louvre's efficiency develops from an exclusive design by which dry air introduced through the louvres contacts every particle. You get maximum capacity in half the space generally demanded by other equipment.

What's more, dependable heat control avoids problems encountered with other dryers using high temperatures. Ordinary types often produce sand too hot to handle readily—that won't mix properly with core oil. Alternative: an extra cooler, needless expense.

Get complete information from a foundry specialist through your nearest Link-Belt office. Or write direct for Book 2511.



Gradual heat transfer from gentle rolling action over slowly revolving louvres eliminates spotty over- or under-drying. Sand is discharged at 120 to 135° F, containing a maximum of 0.5% of moisture. In installations where temperatures to as low as 100° F are required, a combination dryer-cooler can be furnished. Link-Belt builds eight sizes of Roto-Louvre Dryers—in capacities from 1 to 60 tph.

LINK-BELT

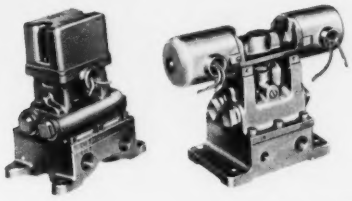
13,793

**HANDLING and SAND PREPARATION MACHINERY**

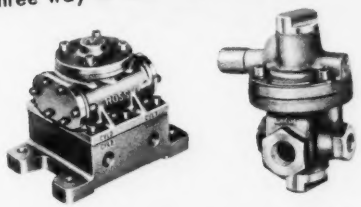
LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

# Complete Line of Ross Air Valves for Simpler Maintenance . . . Less Cost

## You Should Demand One Make of Valves For Your Foundry Equipment

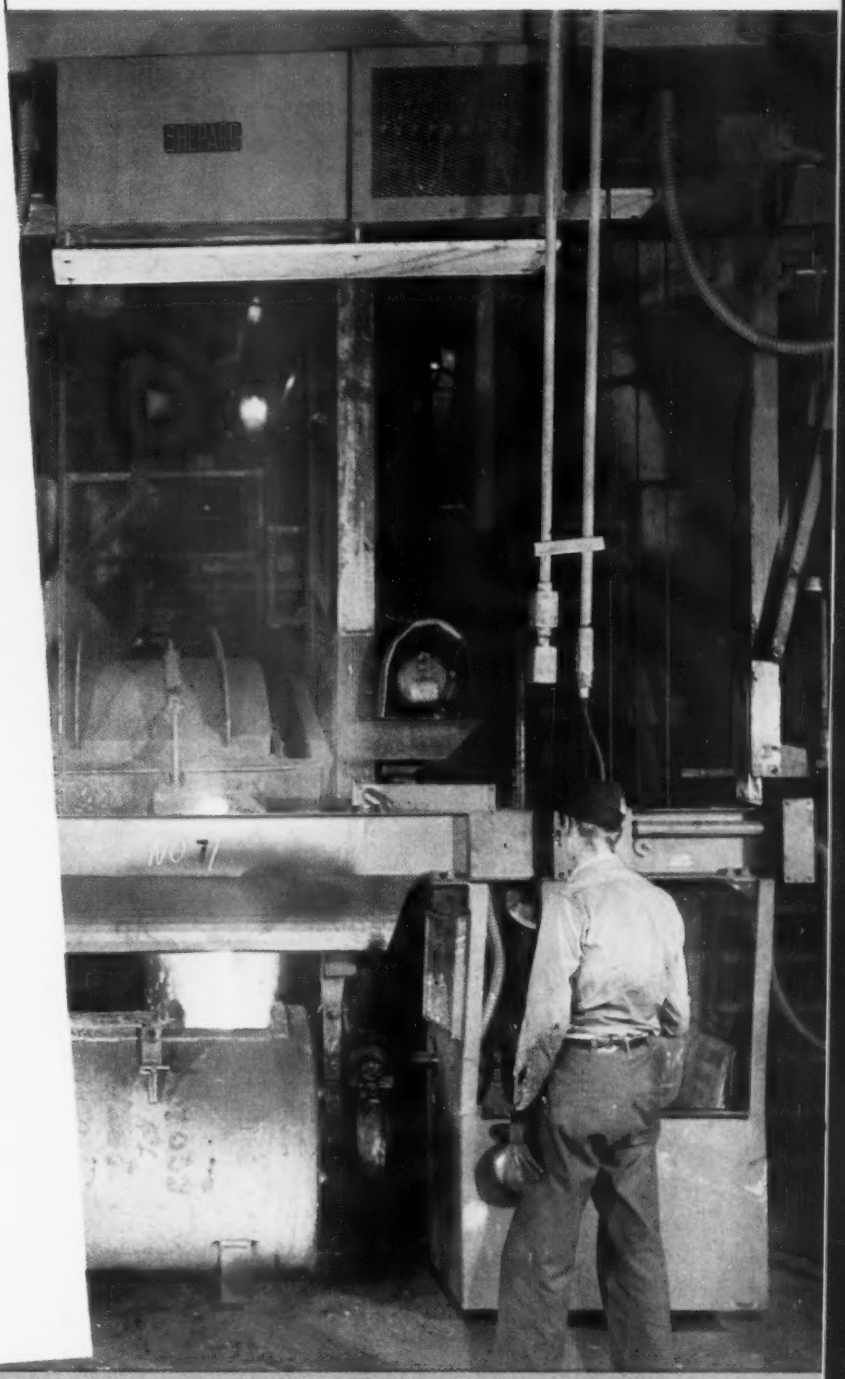


Dustproof single or momentary solenoid valves. Three way or four way. Base mounted.



Retrold (pressure operated) master valve and sequence type valve. Three way or four way. Base or line mounted.

**For maximum efficiency and minimum service expense, insist that your machines are completely Ross equipped. • Ross valves are available in thousands of standard types in 1/8" to 2" pipe sizes. • Prompt, expert engineering service around the world. • Ask your nearby Ross representative to acquaint you with the complete Ross valve line for foundries.**



ROSS Control VALVES

Ross OPERATING VALVE COMPANY

120 E. GOLDEN GATE AVENUE • DETROIT 3 • MICHIGAN

*Photo Courtesy of Chain Belt Company Milwaukee, Wisconsin*

**MULTIPLY PRODUCTION** *with* **Sterling MULTIPLE STACK MOLDING FLASKS**

**Multiple stack molding with Sterling Foundry Flasks is helping the Chain Belt Company increase production way beyond expectations. And efficient continuity of operations paves way for top quality results and greater economies.**

## speeds casting output • cuts costs • saves valuable plant area

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# It Sells Castings

Foundrymen who attended the recent College-Industry Conference of the Foundry Educational Foundation have been heaping praise on the affair for its inspirational aspects.

Because the conference program presented something different in planning the future success of foundry management, these men see a bit more clearly the potentials of this basic industry in an era of great change. As we perfect the machines for castings production, apply the developments of electronics to controls, delve into automation and gather interest in nuclear energy, the progress of the foundry industry depends on the availability of trained men. Reports covering eight years of operation show the FEF and participating engineering schools have contributed much in meeting that need.

Statistics do not tell the entire story, but a few may indicate the progress in the FEF program during the past eight years. While in 1947 only 11 men were teaching foundry practice in the 14 Foundation schools, today 55 men are devoting full time to that work. The number of courses in cast metals offered by these schools has grown from 14 to 55 during that period. Although the foundation contributed only $80,700 for facilities, foundry laboratories in the 14 schools have been improved and expanded to the extent of approximately $1.5 million.

Because colleges and universities have a better understanding of the importance of castings as engineering materials, the scope of instruction in cast metals has been broadened greatly. Foundation schools in 1947 had only 16 engineering departments requiring study in cast metals, while today the total has increased to 55, and 88 different departments now may elect foundry courses. During the past year, 6,046 engineering students took some course in cast metals in the Foundation schools.

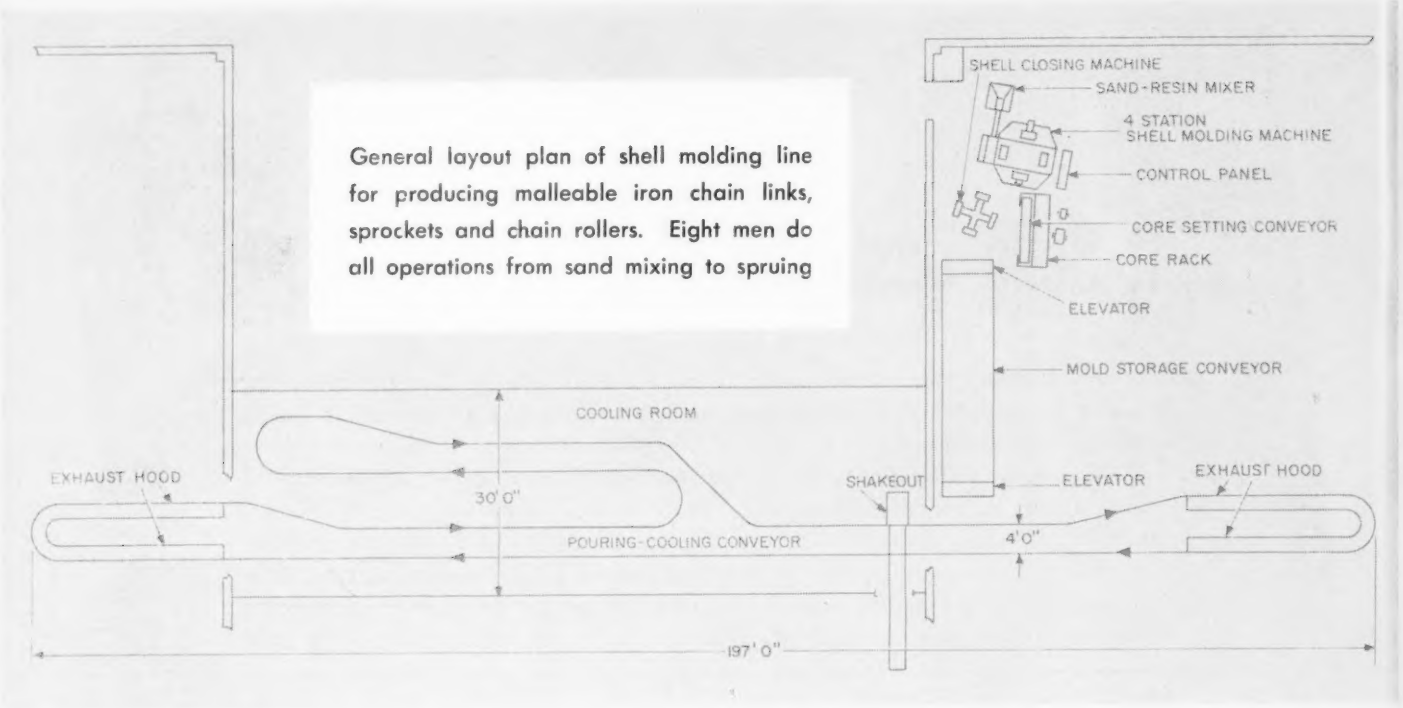
As a result of FEF, foundries have obtained many fine engineering graduates during the past eight years. Many of these men are moving up the ladder to important posts on the management team. These and others to follow will provide the backbone of foundry management in the years to come. As Dean Freund of the University of Detroit said recently, "No industry, no plant can long survive without trained engineering brains."

However, many believe that the most important contribution of the FEF lies in the field of castings promotion. Each year thousands of engineers are learning about the design, manufacture and application of castings. After graduation, many of these men will join companies that use or are potential users of castings. Surely this knowledge scattered throughout industry should permit alert foundry management to do a better job of merchandising its product.

The Foundry Educational Foundation has done a remarkable job, but a much broader field of service lies ahead. It deserves and should receive the financial support and enthusiastic cooperation of each company in the foundry and allied industries.

Frank G. Steinebach

Editor




General layout plan of shell molding line for producing malleable iron chain links, sprockets and chain rollers. Eight men do all operations from sand mixing to sprung

# SHELL MOLD LINE

## Expands Malleable Castings Output

By ROBERT H. HERRMANN
*Associate Editor*

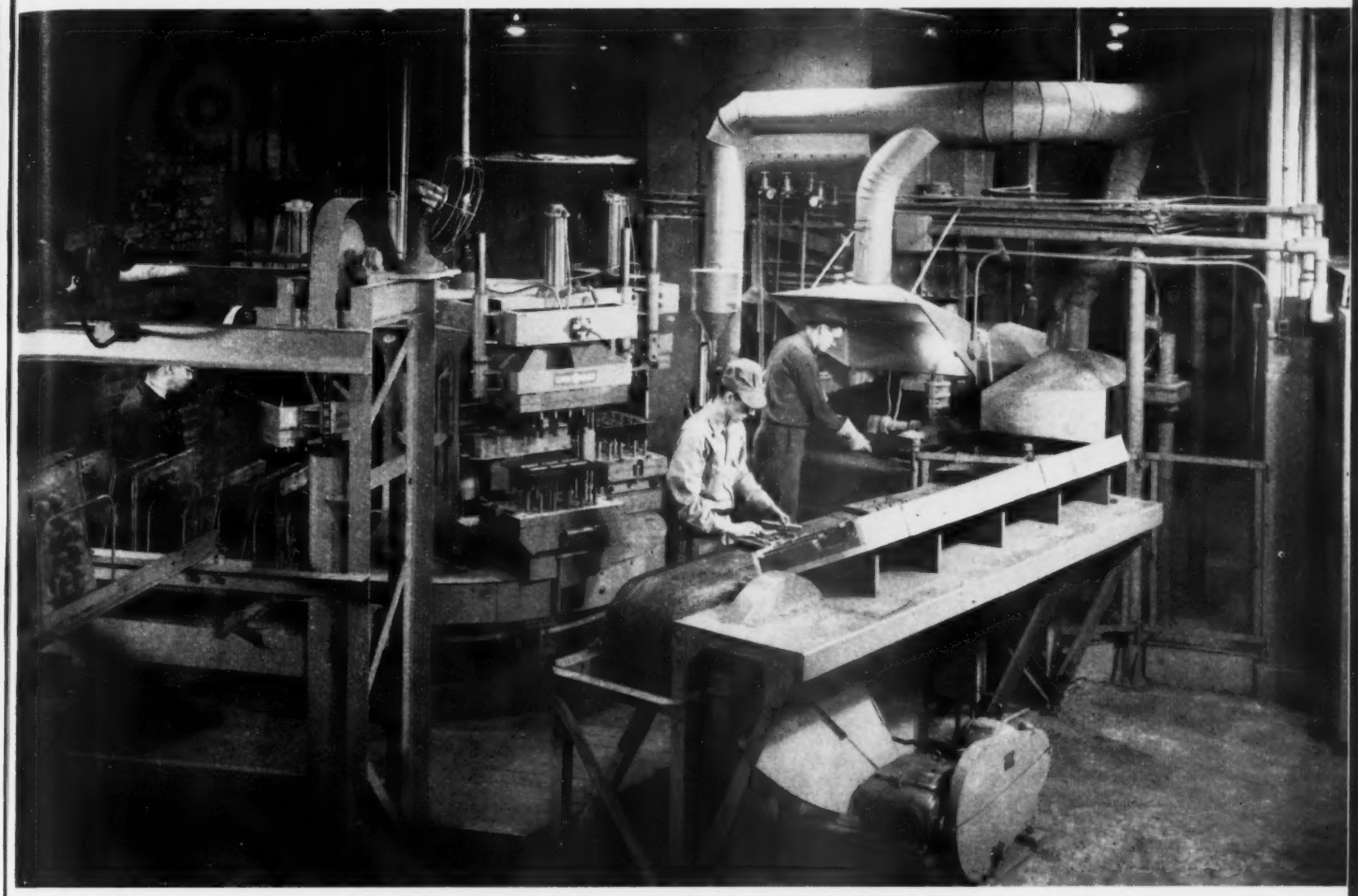
THE new and completely integrated shell molding system at Link-Belt Co.'s malleable iron foundry in Indianapolis is producing 180 molds an hour. Units in the system are a four-station rotary shell molding machine, a belt conveyor at the core setting station, a four-station rotary shell-closing machine, a shell mold storage conveyor, a pouring and cooling overhead trolley conveyor, an automatic mold dumper and an oscillating shake-out conveyor. Several sizes of malleable iron chain links, sprockets and chain rollers are being produced.

Eight men operate the system: One is assigned to the sand mixer, one to the molding machine, one sets cores, one puts drags on the closing machine and transfers completed molds to the storage conveyor, one loads the pouring and cooling conveyor, two men pour and one sprues the castings.

Copes and drags are made on the same pattern plate and one combination shell is produced every 20 seconds. The shell molding machine will handle different patterns at each of its four stations, but pattern plates must be of the same size; current production is with a 16 x 28-in. plate. Since both cope and drag are on the same plate, the mold size is 14 x 16 in. However, the machine will handle plates up to 20 x 30 in., making a mold 15 x 20 in. Maximum designed capacity of the machine is 240 shells an hour.

Resin-sand mix for the shell molding machine is prepared in a paddle type mixer of 700-lb capacity. Mixer is elevated from the floor about 4 ft, and sand and resin are fed to it by a skip hoist. The mix consists of half Michigan City sand of AFS fineness 58 and half Juniata bank sand, AFS 90. They are weighed in a barrel, which is placed on a platform, replacing the conventional bucket on the skip hoist. When the sand is raised and dumped into the mixer, 0.2 per cent by weight of a liquid dust suppressant is added from a hand container. Following 3 minutes of mixing, 42 lb, or 6 per cent, dry resin is added by the skip hoist. Mixing continues for 10 minutes more.

**Sand Conveyed to Machine Hopper**—The mixer



This is the heart of the shell molding system. The four station molding machine is at right rear with control panel at far right. Core setting conveyor is in right foreground, shell closing machine in left rear with mold pallet tray elevator and storage conveyor at far left foreground

is emptied into a floor level hopper through a gate actuated by a hand-controlled air cylinder. A screw conveyor at bottom of the hopper moves the make-up mix to a bucket elevator which also receives excess mix from the roll over and empties into a second screw conveyor above a storage hopper, supplying the molding machine. A metal screen forms the trough of this conveyor. The screw conveyor distributes sand evenly in the hopper, and foreign material is carried to the end of the screen where it falls into a chute leading to a tote box.

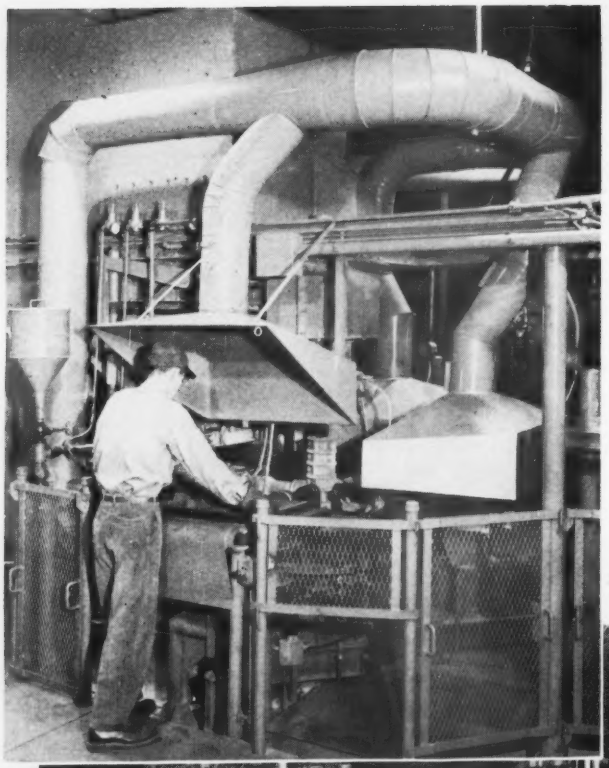
Air-operated gates in the bottom of this 2000-lb capacity storage hopper release sand to an adjustable measuring compartment. For present production this compartment holds about 225 lb of the sand-resin mix.

When a pattern has been indexed to the first station of the molding unit, a flask about 9 in. deep is lowered by air cylinder and locked to the plate by an air clamp. The lower third of this flask is cooled by recirculated soft water. Immediately a hopper is lowered by air cylinder to the top of the flask. Top of this hopper is attached to the resin-sand measuring compartment in the storage hopper by a rubber bellows.

As the hopper touches the top of the flask, water-cooled double gates in the bottom of the measuring compartment are opened by air cylinder to drop the precalculated volume of sand-resin mix through a screen with attached vibrator and onto the pattern. Both aluminum patterns and brass patterns mounted on aluminum plates are used on the machine. Since they are heated to 500-525° F by electrical inserts, water cooling of the flask and the measuring compartment gates is a precaution against transference of heat to these parts. Thus melting of the resin with consequent buildup of sand on the flask and gates is avoided.

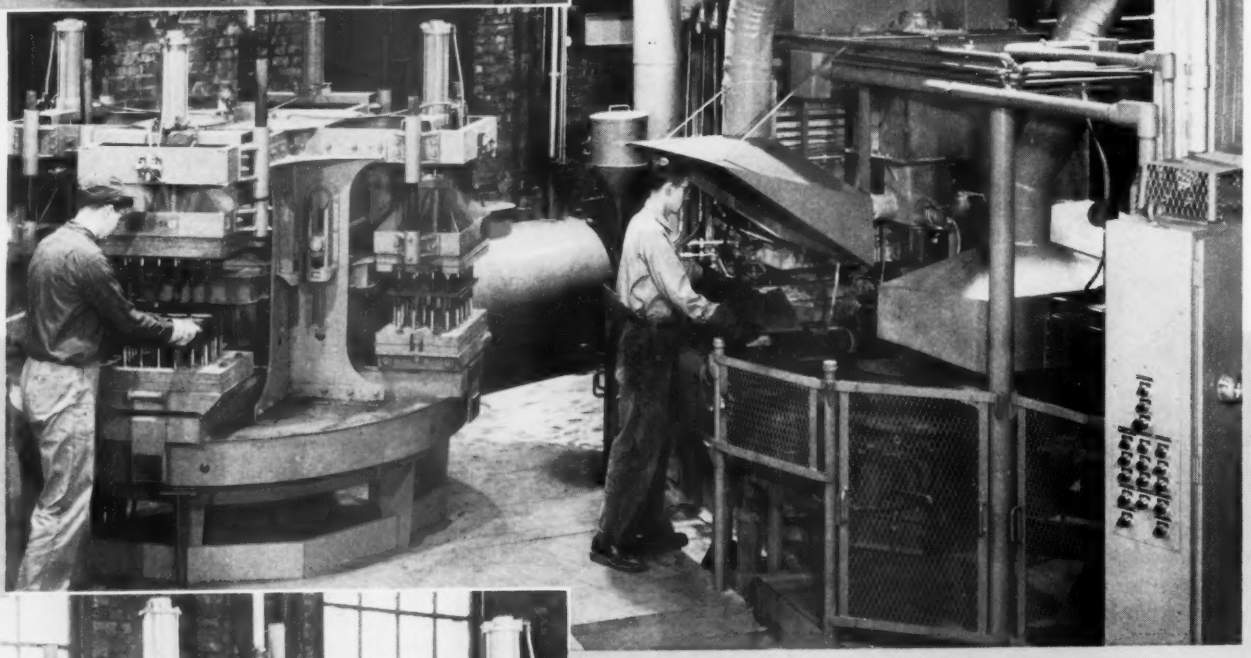
**Pattern Is Invested**—About 150 lb of sand-resin mix is dropped to the pattern and allowed to remain there for about 14-second investment time. During this period the hopper rises to starting position. Then the pattern and flask are rolled over by a hydraulic cylinder actuated by an air cylinder and surplus mix drops into a floor level hopper. A screw conveyor in the hopper bottom feeds the mix to the same bucket elevator which raises make-up mix to the storage hopper. About 9 lb of sand remains on the pattern to form the shell.

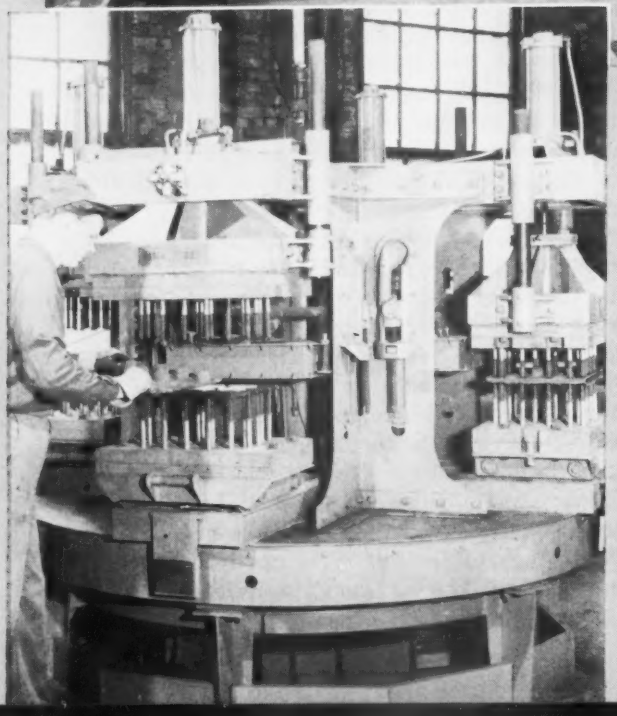
When the pattern and flask are returned to upright position, the air clamp is released and the



flask raised to starting position. The machine table indexes 90 degrees to the right to place the shell under a curing station, containing infra red radiant heating elements. The shell is revolved to a second, identical station on the next cycle. Fourth position is the stripping station. Here a flat plate below the pattern is raised by an air cylinder to contact spring-loaded pins in the plate and lift the cured shell. A worker removes the shell, breaks it in half, and places the drag on the core setting belt conveyor. With a metal rod he punches a hole in the top of the sprue and sets the cope on a previously made drag which has been placed, with its cores, on the appropriate pedestal of the four-station revolving mold closing machine. Speed of this electrically rotated machine is controllable and can be timed to the cycle of the molding machines.

The molding machine operator then inspects the pattern and uses an air hose to blow off loose





At top left is a close-up view of the four station shell molding machine. Center view shows efficient positioning of the molding and closing machines. Bottom close-up view shows closing machine for bonding the molds

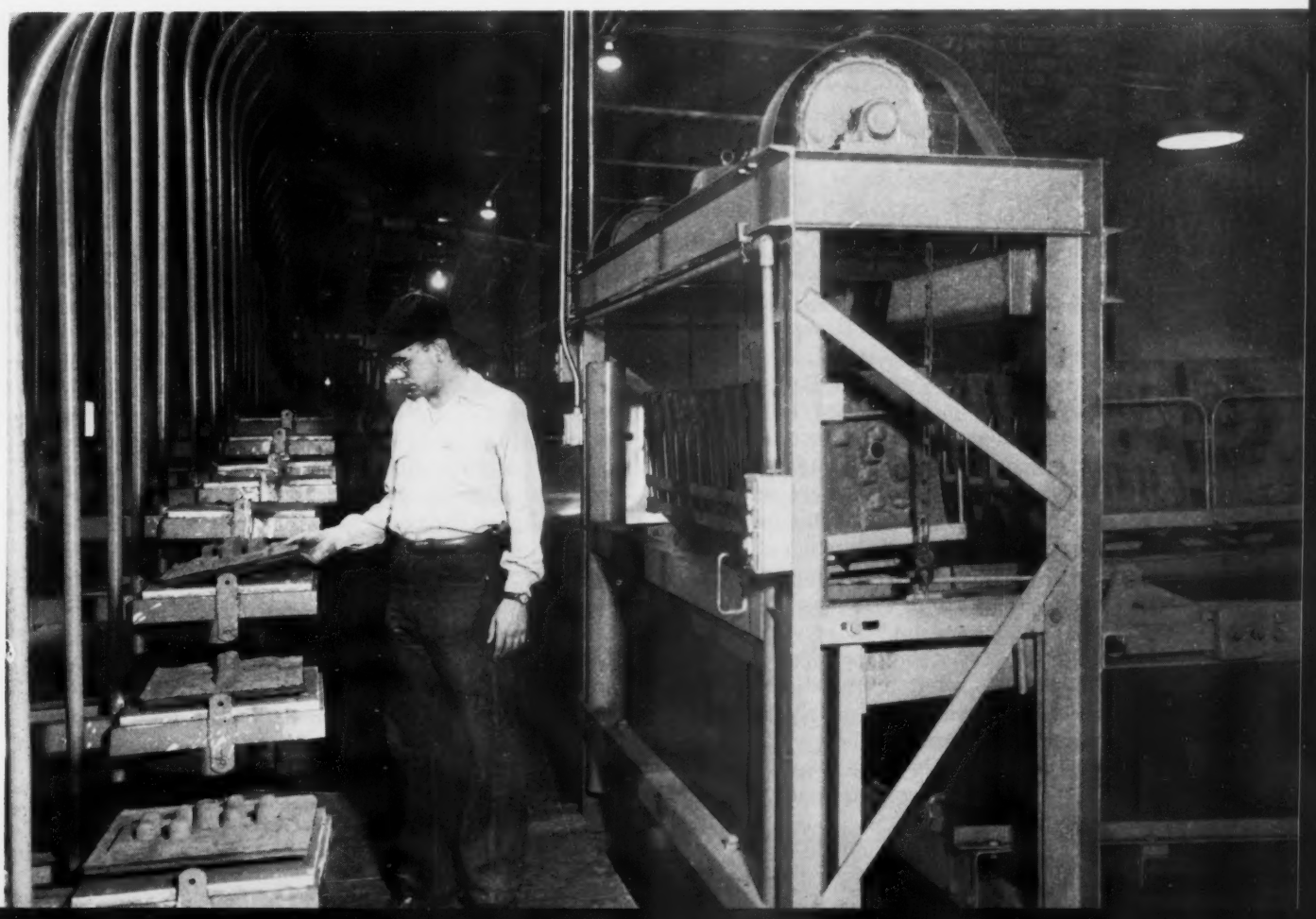
Right—Molds are taken from elevator at unloading end of mold storage conveyor and laid on carriers on the pouring conveyor

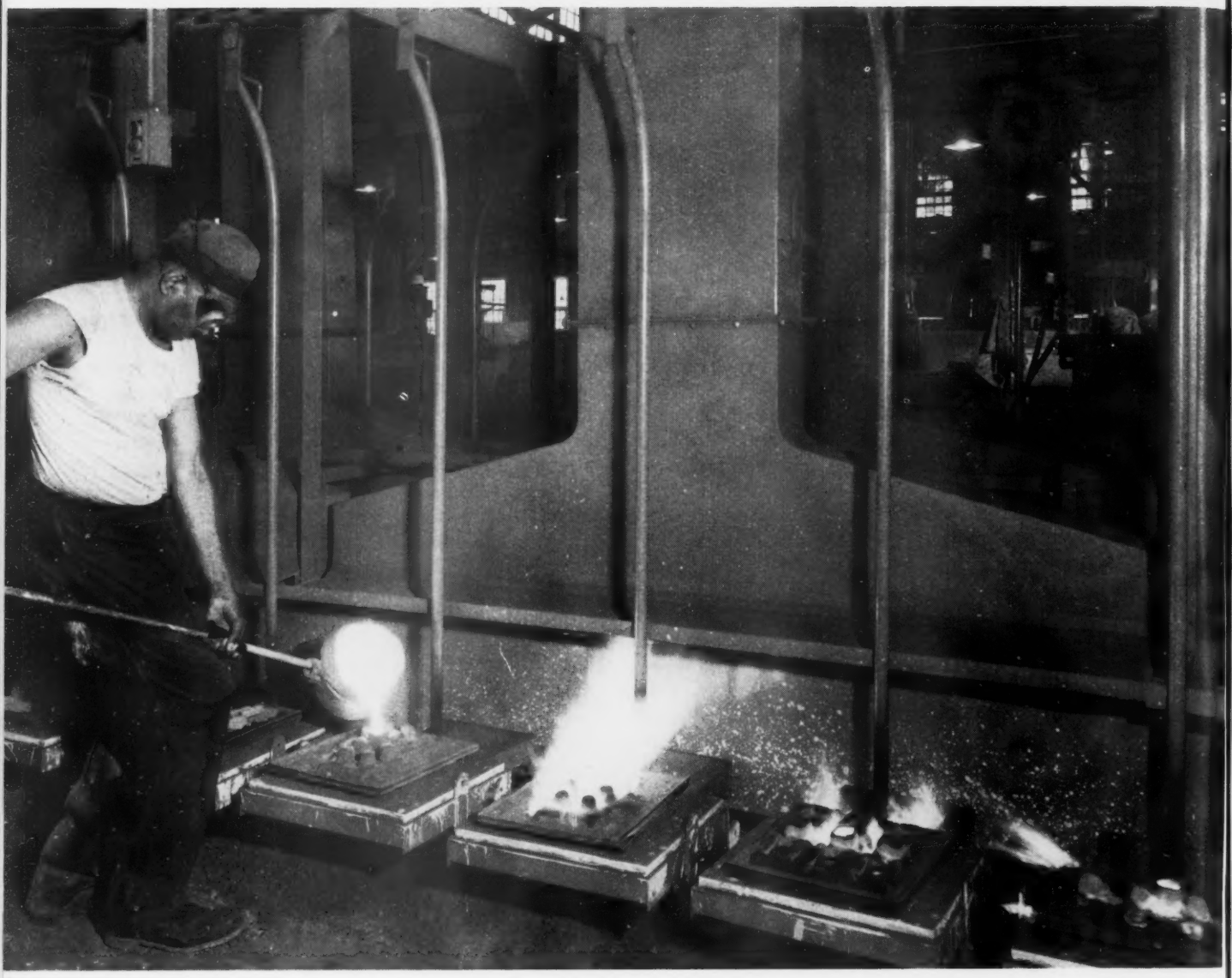
pieces of shell if necessary, and as the pattern is indexed to the investing station it is sprayed automatically with a silicone-naphtha release agent. Table of the molding machine is turned by an electric motor equipped with an eddy current brake which goes into action at completion of about 55 degrees of table rotation. As the table is slowed down, an air-actuated pin with a small wheel at the top is driven up against the bottom of the plate. At completion of the 90-degree turn, the pin flips into a hole in the plate to lock it in position. Movement of all parts in the machine is controlled by an automatic timing device through solenoid valves, and operational speed is adjustable through master switches. Exhaust hoods are located over each machine station.

**Closing the Molds**—Boxes containing cores are placed on a tilted rack at the back of the 8-ft-long core setting belt conveyor. The operator picks cores from these boxes for placement in the drag. The four patterns now in production take 6, 6, 12 and 24 cores, respectively. A third man removes the filled drags from the belt and puts them on spring-loaded pins on one of the pedestals of the closing machine. These pins are mounted on a wheeled table which is hand-pushed on rails toward the center of the machine into position under a small hopper of powdered resin. The plate forming the bottom of the hopper is drilled with small holes for dropping resin on predetermined areas of the drag shell. Resin is dropped through the holes when the plate is air vibrated through a knee lever control at the front of each pedestal.

After the resin has been dropped, the table containing the shell is pulled to the front of the machine. When the drag has rotated to a point behind the shell machine operator, he turns, places the cope on the drag and turns a lever which actuates an air cylinder to lower a wooden plate containing spring-loaded pins aligning with those in the bottom plate. Thus cope and drag are clamped together and become bonded as residual heat in the shells cures the small mounds of freshly deposited resin.

**Molds Stored on Conveyor**—The operator who loads drags onto the closing machine also removes the finished molds. These he places on a pallet tray which is held on an elevator at waist height for loading. Trays are constructed of angle iron and are about 20 in. wide by 6 ft long. The length is divided into 12 sections by U-shaped pieces of steel rod. One shell mold is placed on edge in each section. When the tray is full, the operator presses a button and the tray is raised electrically to line up with rails placed about 4 ft above the floor. He releases a hand catch on the elevator and pushes the loaded tray onto the rails. It rolls by gravity toward the discharge end of the tracks. Through pushbutton control he lowers the elevator to a bottom set of tracks on which empty trays are returned. As the elevator reaches the low point in its travel, it trips a double-acting catch which releases the first empty tray to the elevator and holds remaining trays in position. As the elevator raises the tray for loading, remaining empty trays are released by one part of the catch to roll against





Effective exhaust ventilation at the pouring stations is indicated above. Most molds are poured on asbestos-cement board carriers with no backing

the second part of the catch. Thus another empty tray is placed in position to roll onto the elevator.

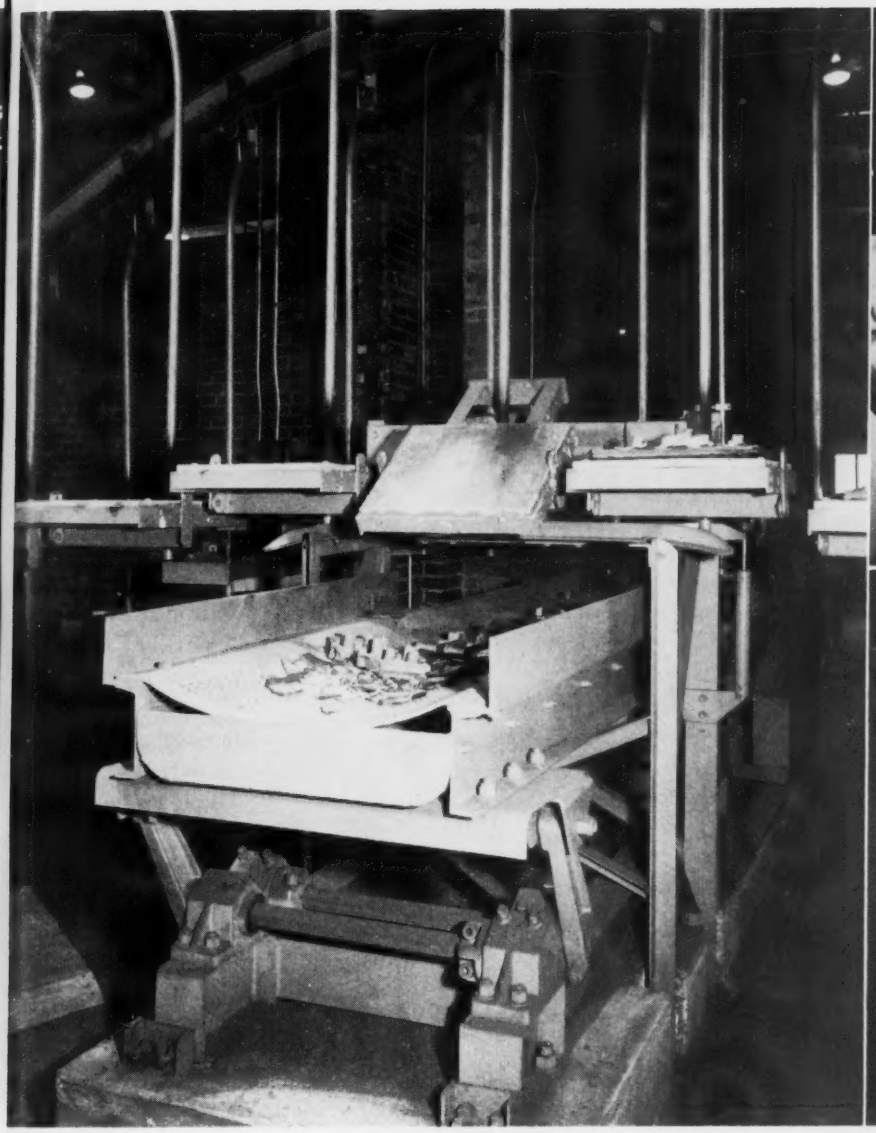
The upper and lower level tracks, holding filled and empty trays, are about 30 ft long and serve as storage area for both molds and trays. Such storage area is necessary at Link-Belt because a continuous supply of molten metal is not available for pouring molds. It would not be required in a foundry having a continuous supply of metal.

One tray at a time is released by a hand catch to a second elevator at the unloading end of the mold storage tracks. Molds are removed by hand from the tray and placed horizontally on shelves suspended by metal tubes from an overhead trolley conveyor.

When the tray on the elevator is emptied, it is lowered electrically. As it approaches the lower tracks, the elevator table is tipped to roll the empty tray onto the return tracks.

**Pour Unsupported Molds**—The overhead trolley pouring and cooling conveyor contains 275 mold carriers spaced at 2-ft intervals. It moves at 16 fpm, but its speed is adjustable to meet varying conditions. Shelves on which the molds are placed are made of angle iron frames with asbestos-cement boards bolted to the top. Present practice is to pour the molds directly on the boards with no support. However, the shelves are so constructed that they can be turned upside down on the carriers and filled with sand or other backing material if it becomes necessary to support some molds during the pour.

Pouring is done at the two extreme ends of the pouring conveyor loop. This is done because metal is available from air furnaces in two different sections of the foundry. Each of four furnaces is tapped twice daily for 30 minute intervals. Pouring is done with shank ladles at near floor level, and fumes are exhausted through low level hoods. Iron is poured at 2750-2800° F. Three of the molds in production take 12 lb of iron; the fourth takes 14 lb.



Air-operated mechanism tips carrier to dump the mold and casting onto the oscillating conveyor

At top are a drag and its casting. Accuracy of the as-cast sprockets permits them to be threaded without premachining

As the mold conveyor leaves the first pouring zone, it rises about 5 ft off the floor to travel over the oscillating conveyor carrying castings away from the dump station. It continues at this height through a 90-ft-long cooling building, descending again to near floor level at the second pouring station. The conveyor then rises again to return through the cooling building. To achieve a cooling time of 12 minutes between the second pouring station and shakeout the conveyor loops around twice in the cooling building. A roof fan assists in circulating the air and venting fumes in this building.

**Dump Molds Automatically** — An oscillating shakeout conveyor is located at the end of the cooling building near where molds are loaded onto the conveyor. As each carrier on the conveyor passes over the oscillating conveyor, an arm at the top of the hanger trips a switch to actuate an air cylinder, which lifts an arm to tilt the mold-carrying shelf. Mold and casting are dumped onto the perforated plate of the oscillating conveyor. A roller on the end of the tilting arm presses against a piece of plate steel welded to two short sections of angle iron protruding from the back of the mold carrying shelf. After a few seconds the arm is lowered, the mold shelf returns to carrying position and the conveyor continues on to receive the next mold.

Castings and pieces of mold travel on an upper level of the 20-ft-long oscillating conveyor and off the end into a chute to a tote box. Filled boxes are moved periodically to a spruing station where one man handles production from the shell molding line. Sand falls through the perforated plate and moves along the bottom pan of the oscillating conveyor to a belt conveyor which carries it to a storage bin.

The molding machine in this installation was developed by Link-Belt in collaboration with Walworth Co., New York. Other units in the installation are Link-Belt equipment.

## *British Practice in Producing*

# ALUMINUM BRONZE CASTINGS

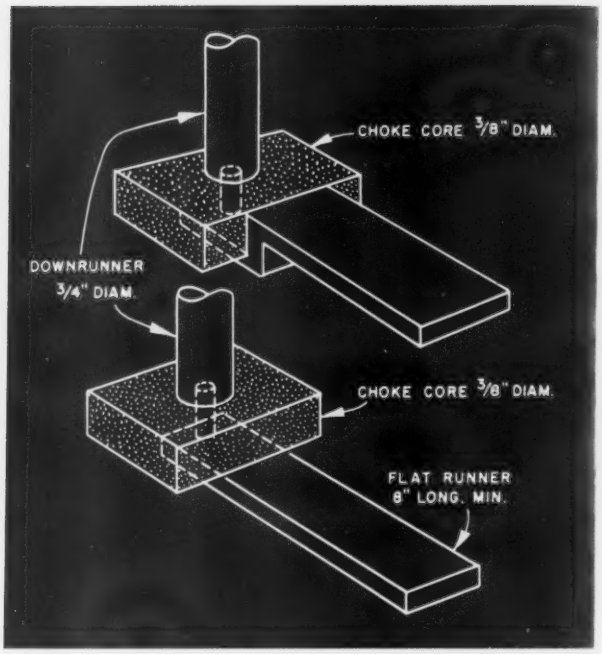



Fig. 1—Running system for aluminum bronzes uses simple choked gates. Flat runner tapers from 1 x ¼ in. near casting to ⅞ x 3/16 in. near choked downgate

ALUMINUM bronzes now used commercially in British foundries may be divided into two groups: 1. Those containing up to 7.5 per cent aluminum and possessing a homogeneous microstructure; 2. Alloys containing 8-12 per cent aluminum which possess a duplex structure.

The first type is used mainly for wrought applications and on a limited scale for ornamental castings. The second group includes the majority of aluminum bronzes cast into sand or metal molds. Aluminum bronzes are thought to have been developed by Percy almost 100 years ago, and much development work was carried out subsequently in France and elsewhere.

Their early promise in the field of corrosion resistance has been affected in recent years by development of many stainless ferrous alloys, and aluminum bronzes now are competitive mainly with manganese bronzes. Straight copper-aluminum alloys are not used for castings production since the material suffers a structural change during slow cooling which causes reduced physical properties.

This defect is known as "self-annealing" and is a type of embrittlement which appears in slowly cooled copper-aluminum alloys. In the early days of the industry, extensive chilling was used to combat this defect. Alternatively, castings were stripped from the mold at high temperatures. Castings suffering from this defect sometimes could be recovered by quenching and tempering if the design was favorable.

An easier technique now well established involves the addition of iron or iron and nickel to the base alloy. Iron also is effective in increasing strength at elevated temperatures, refining grain and probably in improving wear resistance.

Manganese is added to deoxidize and to obtain additional casting soundness. The ultimate tensile strength of aluminum bronze is increased by 9000 psi for the addition of every 1 per cent of manganese. Higher strength alloys contain up to 5 per cent nickel. Many proprietary aluminum bronzes are made, but the majority correspond to British Standard Specification No. 1400.

**B.S.S. 1400—ALUMINUM BRONZES**

| | Al, % | Fe, % | Mn, % | Ni, % | Ten. Str., lb | Elong. On 2", % |
|---|---|---|---|---|---|---|
| AB.1.C | 8.5-10.5 | 1.5-3.5 | 1.0 max | 1.0 max | 71,680 | 20 |
| AB.2.C | 8.5-10.5 | 3.0-5.5 | 3.0 max | 3.0-5.5 | 89,600 | 12 |

Alloy AB.1.C is used for sand castings to a limited extent, but is used more often for permanent mold castings. Alloys corresponding to the AB.2.C specification are used widely for sand castings and also for forgings.

Aluminum bronzes can be improved by suitable heat treatment, although it seldom is applied to sand-cast material in British practice. Permanent mold castings may be heat treated, and the alloy structure is affected in a similar manner to that of carbon steel when quenched and tempered. Heat treatment is hindered in most cases by the effects of casting size and section thickness. Permanent mold castings in AB.1.C alloy regularly give 78,400 lb ultimate tensile strength and 30 per cent elongation on 2 in., without heat treatment,

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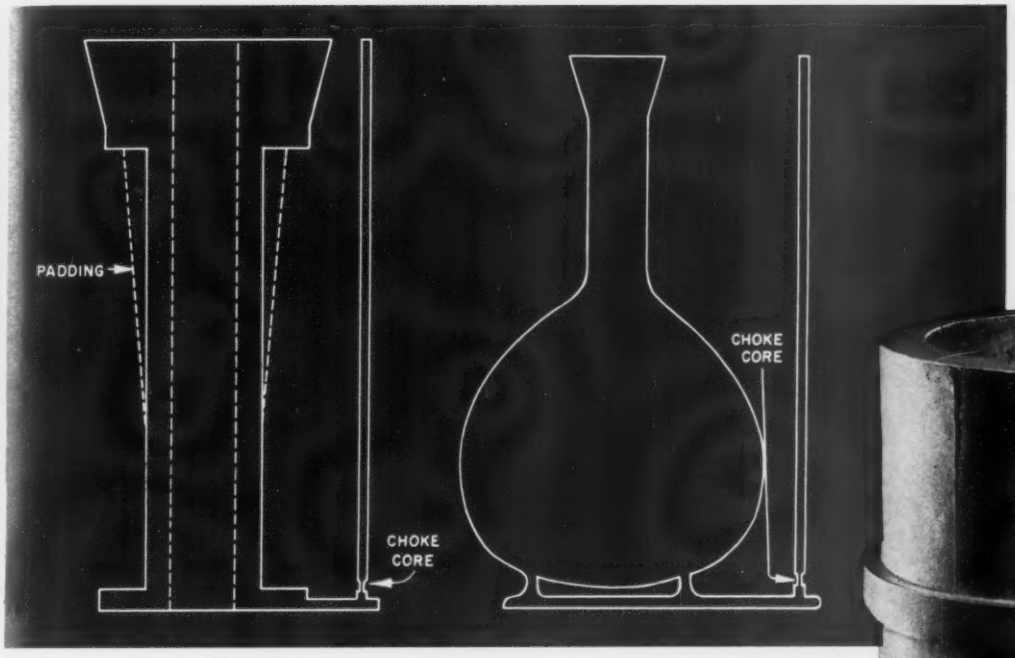



Fig. 2—Use of extensive padding as shown was required before this simple flanged pipe could be made pressure tight

Fig. 3—Variable pitch marine propeller blade of varied section and about same weight as pipe casting was cast easily

Fig. 4—Aluminum bronze permanent mold casting for use in mining equipment weighs about 7 lb. Courtesy Frys Diecasting Ltd., Wordsley, England

and this alloy is usually specified where the greater physical properties of the more expensive AB.2.C material are not required.

Permanent mold castings up to 40 lb are practicable, and castings up to 12 lb are made regularly. Between 15 and 25 million aluminum bronze permanent mold castings are made annually in Britain; approximately 20 per cent are for the automobile industry. Typical applications for AB.1.C alloy include heavy duty bearings, gears and gear selector forks.

Various items of marine equipment such as rudders, small propellers and stern tubes are made in AB.2.C alloy since this material has high resistance to salt water corrosion. Aluminum bronze is nonmagnetic, and this property, combined with high physical properties, has caused AB.2.C alloy to be specified for many castings intended for use in naval craft, particularly minesweepers. This alloy also finds application in general and chemical engineering, where resistance to scaling is required and useful physical properties at temperatures up to 750° F are needed.

Improved materials containing substantial amounts of manganese and nickel have been developed recently. These alloys are likely to become quite popular since they are 10-12 per cent lighter, give better physical properties and are equally resistant to corrosion. They now are used to a limited extent in propeller manufacture.

Aluminum bronzes containing silicon sometimes are used for valve bodies, pickling equipment and pump parts. These alloys are resistant to the acid solutions encountered in pickling and have better bearing properties than ordinary aluminum bronzes.

Much of the difficulty encountered in the production of aluminum bronze castings is of a metallurgical character. A standard melting practice is essential, and deviation from it may cause considerable foundry difficulty. Principal defects are caused by aluminum oxide inclusions and iron and aluminum segregation.

**Melting**—The following are typical 650-lb furnace charges for AB.1.C and AB.2.C aluminum bronzes; *AB.1.C*—557 lb 6 oz, electrolytic copper; 19 lb 8 oz, iron wire; 65 lb, aluminum; and 8 lb 2 oz, 70 per cent manganese copper. *AB.2.C*—387 lb, electrolytic copper; 29 lb 4 oz, iron wire; 68 lb 4 oz, aluminum; 19 lb 8 oz, 70 per cent manganese copper; and 146 lb, nickel copper (80-20).

The raw materials specified in these furnace charges are not always used. Tough pitch copper ingot, mild steel scrap, ferromanganese, Monel scrap and aluminum-copper scrap sometimes are

substituted, and the cost of alloy production is reduced accordingly. There is no doubt that high-grade alloys require raw materials of equally high grade, yet the use of pure aluminum, pure iron wire and nickel shot renders aluminum bronze production more difficult.

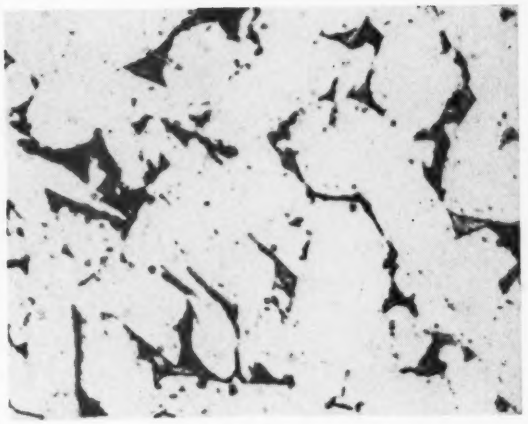
If crucible melting is used, the additions of relatively high melting point metals such as iron wire, ferromanganese or nickel shot are placed in the bottom of the crucible. Then most of the ingot copper is charged. The charge is melted rapidly and superheated to insure complete solution of the alloying elements present, and the remaining copper is added to reduce the bath temperature. Manganese copper is stirred into the melt to insure deoxidation.

When aluminum is added to molten copper, considerable heat is developed, and if the molten copper is excessively hot and oxidized, large quantities of aluminum oxide may be formed; aluminum losses then will be high. There is no effective foundry method of recovering the aluminum oxide since it cannot be reduced back to the metallic state under normal melting conditions.

The specific gravity of aluminum is so much less than that of copper that difficulty may be encountered in mixing the two metals. Each aluminum ingot should be held in tongs and forced below the surface of the molten copper. It should not be allowed to melt upon the surface. The melt then must be mixed thoroughly with a refractory plunger. Efficient mixing occupies a lot of time, and aluminum bronzes containing substantial amounts of iron are especially difficult. Aluminum segregation often is found in alloys made by inexperienced workers. Melting fluxes frequently are recommended for these alloys, but are not essential. The efficiency of mixing can be checked by fracture and examination of small test bars.

Rocking arc electric furnaces are invaluable for the production of aluminum bronzes since they afford close control over melting and mixing conditions. It frequently has been stated that the proportion of scrap used in aluminum bronze melts should be restricted, and many European workers believe that the physical properties of castings made from remelted scrap are inferior to those obtained from virgin ingot. This view is not supported by British experience, and all remelt charges are used regularly. Good quality scrap is the equivalent of ingot and can be melted easily time after time without difficulty. Aluminum bronze is not changed in chemical composition by repeated remelting at normal temperatures, although small losses of aluminum may be found in material frequently remelted at high temperatures.

Pouring temperature is not critical in that the physical properties of the castings are little affected if poured in the range of 2100-2250° F. The gas absorption problem generally encountered in the melting of nonferrous alloys is not found in aluminum bronze production unless high pouring temperatures exceeding 2350° F are used. No shrinkage is seen in the risers under such conditions, and unsound castings usually are obtained.



Gas absorption difficulty appears more often when cryolite type fluxes are used during high temperature melting. Aluminum bronzes normally have a high apparent shrinkage and require feeding to almost the same degree as steel. In addition, the tenacious oxide film which is present when the alloys are either molten or solid complicates running methods and casting repairs. Welding was especially difficult until the introduction of argon arc welding methods effectively solved the problem.

The running methods established for aluminum bronzes are those which allow nonturbulent filling of the molds. Top running seldom is possible in green sand molds because of the danger of excessive dross formation. This problem is influenced by the presence of moisture, and experience has shown that if a casting of given design is made in a green sand mold, a skin-dried mold, a dry sand mold and finally in a metal permanent mold, the running method needed to produce a clean, sound casting becomes progressively simplified. The relatively simple running and feeding arrangements used in permanent mold casting seldom are effective in the production of sand castings.

Reversed horngates often are recommended for aluminum bronze castings, especially when suitably choked, but are not essential and can be regarded as an additional complication in molding. The simple choked gates shown in Fig. 1 have proved effective in the production of hundreds of tons of aluminum bronze sand castings and are preferable to horngates.

It may be supposed that such running methods increase the prospect of turbulence, yet when a choked runner of the type illustrated is joined to a flat bar ingate, nonturbulent mold filling is assured, and many types of aluminum bronze castings can be made successfully. Such methods are equally

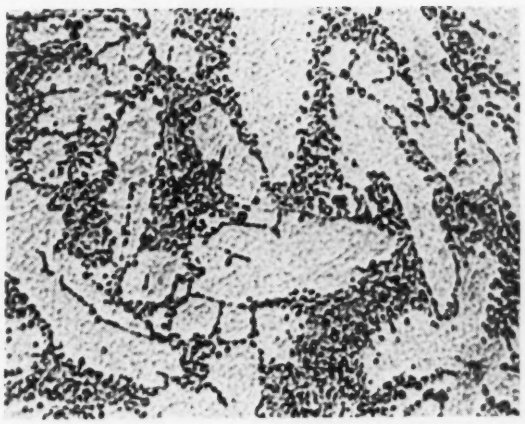
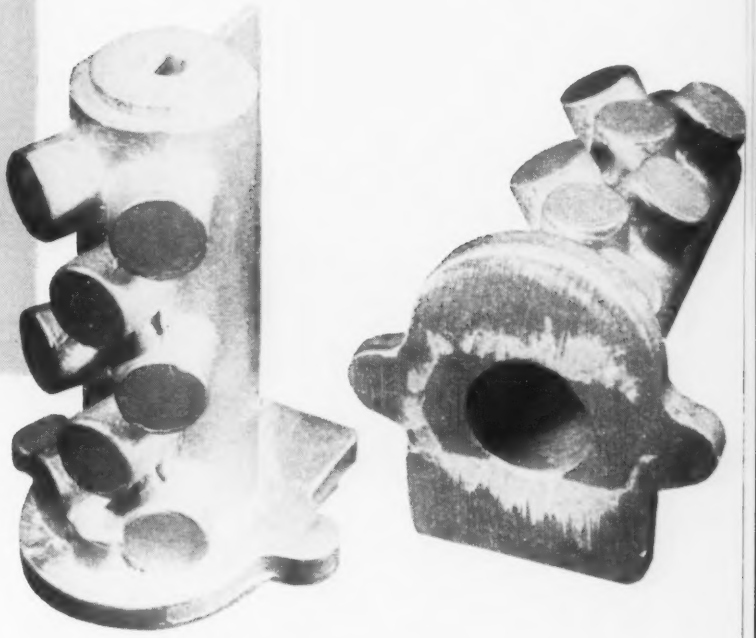


Fig. 5 (left)—Micrograph shows structure of aluminum bronze BSS 1400 AB1. X250

Fig. 6 (above)—Micrograph of structure of aluminum bronze BSS 1400 AB2. X250

Figs. 7-8 (below)—Two views of a typical aluminum bronze permanent mold casting; weight 5 lb



effective for castings made of manganese bronze.

The simple flanged pipe illustrated in Fig. 2 was required to be pressure tight, and intended for the production of puffed cereal breakfast food. Varied running methods and extensive chilling were tried in turn, but this casting could not be made sound until extensive padding was applied as illustrated. In contrast the single blade for a variable pitch marine propeller (Fig. 3) was of varied section thickness and of approximately the same weight as the pipe casting shown, but no difficulty was experienced in production. Many hundreds of blades were made in this manner, and these castings afford useful examples of the difficulties which may be encountered in aluminum bronze castings production.

Pressure-tight castings often are specified in aluminum bronze and may not be obtainable by ordinary running and feeding methods. The Durville method of ingot pouring has been adapted for sand casting production and affords a combination of nonturbulent pouring and good feeding conditions which gives clean castings of maximum soundness. Durville techniques involve mounting the flask and a suitable metal container in line upon a rigid metal table designed to tilt smoothly through 180 degrees.

The metal container is filled with a measured quantity of alloy, and the table is tilted slowly to allow the bronze to flow smoothly into the mold cavity. In this way the surface film of oxide is undisturbed, and dross formation is restricted. A combined runner and riser of wedge shape is used and is heated effectively by the passage of the full amount of molten alloy into the mold. The hottest alloy is located in the riser, and best feeding conditions are assured; mold erosion seldom is possible when Durville methods are used.

Aluminum bronze alloys have a high apparent shrinkage, and risers of large capacity usually are needed for efficient feeding. The yield normally is quite low, and finished casting weights frequently are only 50-60 per cent of the weight of liquid metal used. Exothermic and insulating mixtures can be applied profitably to the risers of aluminum bronze castings to increase yield.

These alloys have a narrow freezing range and form a tough, impermeable skin during solidification. Experimental work has shown that atmospheric heads can be applied usefully to aluminum bronze castings. Chills can be made of aluminum bronze if they are needed since this material has a heat capacity approximately equal to that of gray cast iron and in addition has a longer service life.

Finishing operations are not easy since these bronzes are quite tough. Although band sawing is used for small castings, abrasive cutoff wheels are needed for medium and heavy castings. Cleaning usually is not needed since the aluminum oxide film present on the alloys prevents sand penetration so effectively that simple wire brushing serves to remove the sand. Consequently, any ordinary molding sand suitable for nonferrous work can be used for aluminum bronze castings.

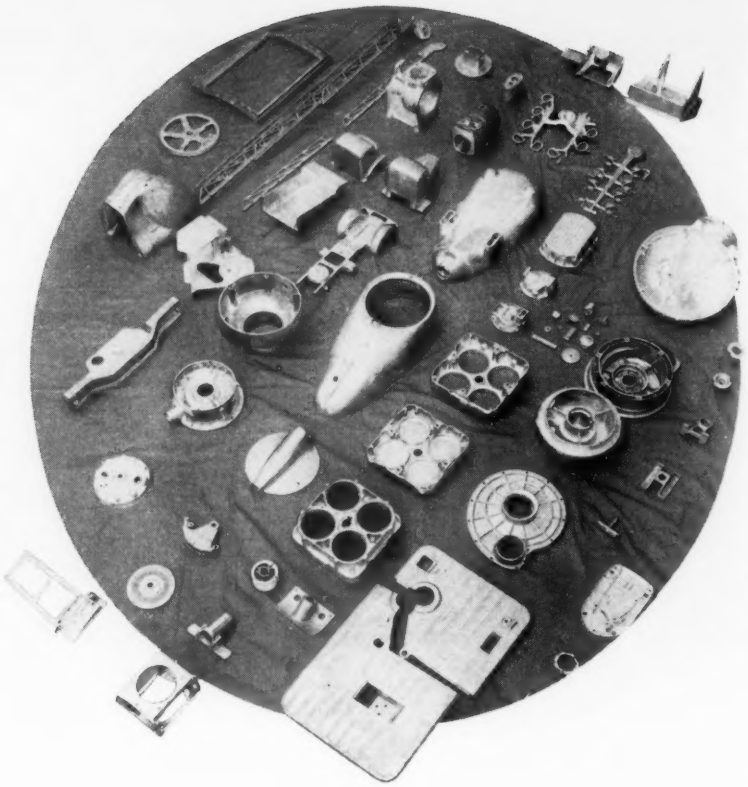


Fig. 1—Die cast products of Harvill Corp.

# Industrial Expansion Spurs Die Casting in Southern

By LEWIS B. REED
*Industrial Heating Consultant*
Los Angeles

INGENUITY has always been the keynote of Pacific coast industry. Generally unable to compete with eastern mass-produced items, until recently West coast manufacturers found it imperative to make items particularly applicable to far western living, or to come up with ingenious ideas which could give them an edge over standard high-production goods. Although usually it has been a case of an individual or small company bucking a big corporation, many far westerners have made it pay off.

Los Angeles was one of the nation's aircraft manufacturing centers when World War II started. When that business really boomed in 1939-40, aircraft manufacturers were unable to expand their facilities fast enough to handle the job. Consequently, much of the work was passed on to subcontractors, sub-subcontractors and beyond. Every home garage was a potential factory, and anyone possessing a usable machine tool could become a manufacturer.

"We didn't know it couldn't be done, so there was nothing to prevent us from doing it" was heard many times. And ingenuity continued to pay off after the war when an unprecedented expansion boom hit the West coast. This has been particularly true in the Los Angeles area.

Die casting is not the best example of how industry has come of age in southern California, or of how the local resources of ingenuity work, but it does show what can be done in a competitive industry.

The ever increasing move of major industries westward, and the terrific expansion of the aircraft and electronic industries, has required the die casting industry to meet added demands by developing new techniques in die making and casting. Today the southern California die casting industry holds an enviable reputation for producing quality castings on a national competitive price basis, and it is not uncommon for eastern manufacturers to prefer the services of southern Californian die casters.

No other area in the United States can begin to top Los Angeles county in a census of die casters. Twenty-five years ago there were only one or two die casters in southern California. Today there are over 100 independent companies,

Fig. 2 (above)—New plant for die casting was built by Martin-Ruegg Brass & Aluminum Foundry, Los Angeles sand casting company

Fig. 3 (right)—Latest equipment is used in the new Martin-Ruegg die casting plant

# California

Fig. 4 (above)—Laboratory at Harvill Corp.

Fig. 5 (right)—Union Die Casting Co. just completed new plant, shown here in sketch

Fig. 6—Die casting department at Alloy Die Casting Co., Los Angeles

but space does not permit a complete report on southern California die casting or even mentioning all the outstanding shops. What follows are only a few of the high lights concerning a limited number of shops in this extremely active industry.

**Harvill Corp.,** one of the largest of the area's die casting plants, is a good example of what keeping up with progress means in southern California. To insure technical control over its operations, this company maintains one of the finest, completely integrated laboratories in the die casting industry. Spectrographic, x-ray, fluoroscopic, tensile and impact testing equipment assure conformity with specifications. Here, under the capable eyes of Paul Winslow, spectrographs are run on every batch of metal.

Harvill has die cast brass and high-temperature alloys, in addition to the commoner die casting metals. While production of these castings generally presented no unsurmountable problems, known die steels did not stand up to the pressures and temperatures used. To overcome this, a research program was started to find die metals capable of economic casting of alloys with melting temperatures up to 3000° F. Government development contracts call for research in new alloys, new machines and new control techniques.

Occasionally rumors are heard of alloys with unusual properties being produced in Europe. Harvill's experiences in getting some of these alloys out from behind the Iron Curtain makes an interesting story, but one running into considerable detail. They are not publicizing the results of their tests on these imported alloys.

**Union Die Casting Co.** might get into an argument if it said it was the oldest die casting company in the local area, but there is no question that it has the newest plant. One of the first die casters established in Los Angeles, it recently moved to a new location where there is plenty of room to expand.

The company has a long record in the die casting business, and it seems as if almost every local die cast man got his start either there or at Harvill. Union believes it was responsible for many innovations in the past, but there are few secrets in the business and it is hard to say who originated what.

One die in use is worthy of comment. It is a unit die—a die with eight replaceable cavities—and is used to cast slip joint locknuts. Each cavity casts a different size locknut and is changed according to the demand for particular sizes. Each locknut is cast around a core which molds the internal thread. As the die opens, the core is rotated and retracted, permitting automatic ejection. These threads are said to be much stronger than machined threads.

Unit dies are used as much as possible. With this method it is unnecessary to change an entire die to run a new piece, and one die can handle a number of dissimilar jobs. Part changes are made simply by changing the unit insert. The average die has four inserts.

In addition to local business, the company ships throughout the United States and some foreign countries. Besides a line of plumbing hardware, it has a specialty product in name plates used mainly by appliance manufacturers.

**Martin-Ruegg Brass & Aluminum Foundry** cannot complain about lack of competition. There were already over a hundred shops in the area when the company started in the die casting business, but it thought there was room for one more good shop. Today it is handling many jobs which proved

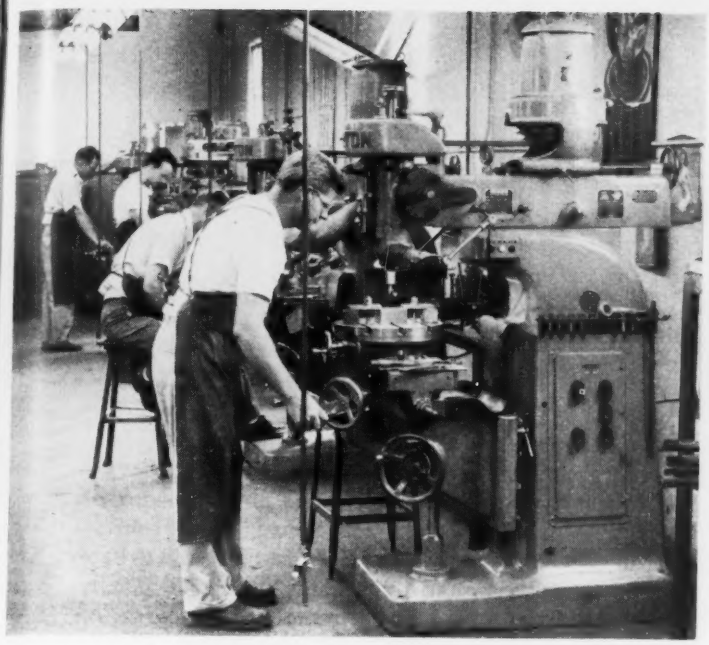


Fig. 7—Alloy Die Casting Co. has one of the finest die making shops in the Los Angeles area

distasteful to other jobbers—a rough way to find out if you really have a good shop.

Actually the company is not a newcomer in the foundry industry; it has been making brass and aluminum sand castings for many years in Los Angeles. The physical plant of its die casting division in Gardena, Calif., is very good—a new, light, roomy and airy building. Equipment includes new casting machines with 250 tons locking pressure and new electric induction melting furnaces.

Die casting is primarily a mass-production industry and normally is at a disadvantage on short production runs. Therefore, it seems improbable die casting companies would do much business with aircraft manufacturers whose production runs are short, changes notoriously frequent, and specifications hard to meet. Yet **Alloy Die Casting Co.**, at a time when 80 per cent of its work was for the aircraft industry, earned the reputation of being one of the outstanding die casters in the area.

Naturally the primary success of any die casting job depends on the die. Shops producing the best castings are usually those with the best engineering brains, the best diemaking know-how, and adequate die shop facilities. Alloy Die Casting Co. claims to have one of the best equipped die shops on the West coast.

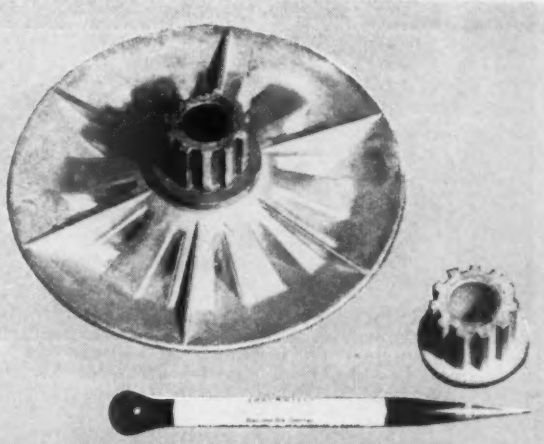
Pin gating is an innovation of which the company is proud. This is a standard plastic injection molding method for gating, but until recently had not been considered satisfactory for die casting. Some shapes, particularly round or symmetrical castings such as pulleys and drums, lend themselves very well to gating dead center. Locating a die casting gate in the center, however, is not always possible with conventional die casting gating methods.

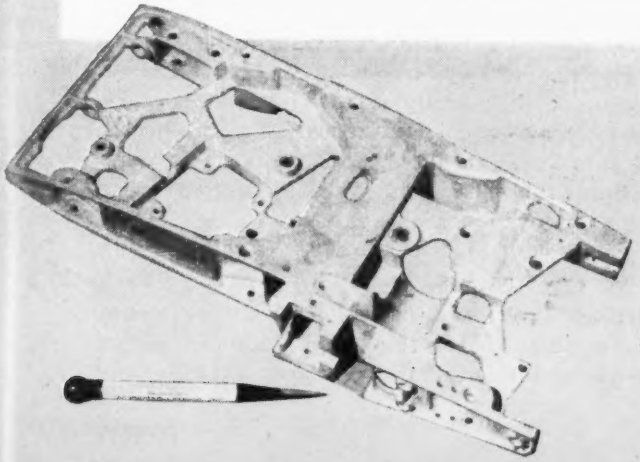
Symmetrical flow which permits equal fill of all portions of the casting and allows maximum venting at the extremities of the casting is the main advantage of pin gating. The disadvantage is the necessity for rather complex tooling, resulting in the possibility of slower production. Both advantages and disadvantages must be weighed

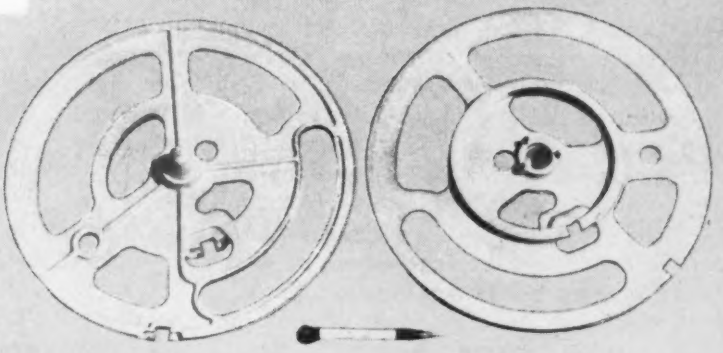
Fig. 8 (top right)—View shows one-half of a Gilmer pulley. The spline, shown at right, is a powdered metal piece and is cast into pulley

Fig. 9 (below)—Cast to extremely close tolerances, this die casting consists of very thin sections and contains 5 stainless steel inserts

Fig. 10 (lower right)—Gate ⅛ in. in diam is example of pin gating at Alloy Die Casting Co. Drum assembly control must pass USAF inspection







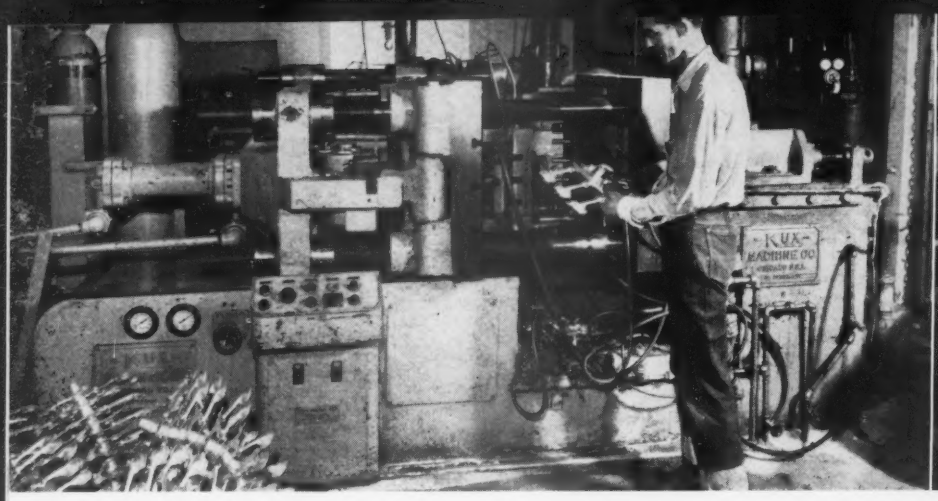


Fig. 11 (above)—Fords and Chevrolets assembled in West utilize Kwikset Lock Co. die castings

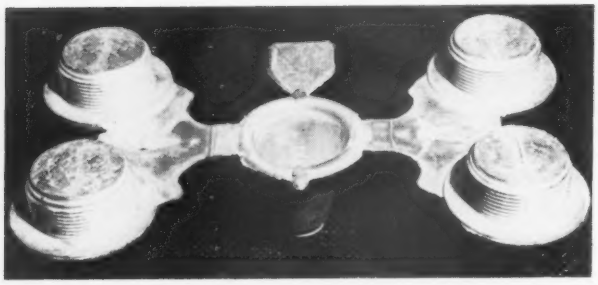


Fig. 13—Plugs cast by Kwikset are ready to use after gate has been cut off. Note lack of flash

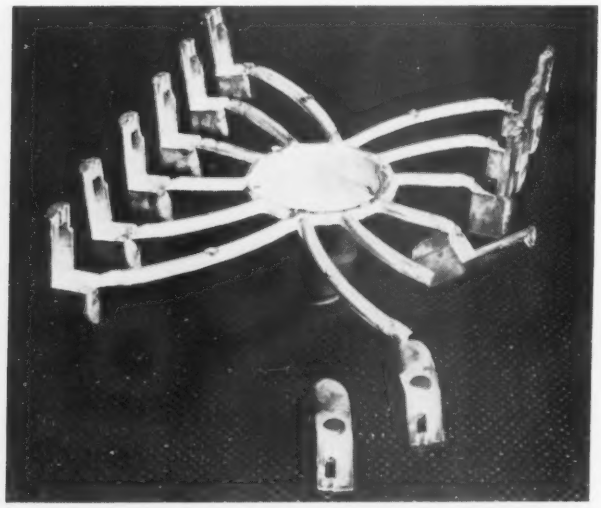


Fig. 14—Slight jar on the sprue of Kwikset die casting breaks latch bolt from 0.014-in. gate

carefully before selecting the method of gating any casting. Fig. 10 shows a pin gated casting.

Alloy Die Casting Co. feels its type of management makes the most of each man's ability and has been responsible for the close co-operation between all the employees and for one of the reasons behind its success. Bill Holmes, owner of the company, is not the executive type who occupies a big office and dominates the entire enterprise. He gives his associates much freedom in making their own decisions. This affords him the opportunity to spend considerable time in the shop where he can give the company the full benefit of his practical experience.

**Universal Die Casting Co.** is one of the leaders in casting brass on the Pacific coast. The company's experience with brass dates back to 1940 and its specialty is hardware and plumbing goods. Such experience pays off when the cost of the die is included in any job. Die life usually is short when working with brass, but the company has been able to guarantee at least 50,000 first-quality shots from every die. The average is 200,000 shots per die, and one die is still going strong after 600,000 shots.

Universal was the first local die caster to install an electric induction holding furnace for brass. The furnace was so successful that a second one was ordered within 30 days, and since then there has been a trend toward use of the same type furnace by other brass die casters.

In view of the more than one-hundred die casting jobbers in the Los Angeles area, it seems unlikely any casting consumer would care to invest in a shop of its own. Yet some of the local captive shops, several of which will be discussed here, are among the best in the country.

**McCulloch Motors Corp.,** specializing in lightweight engine-driven tools, is one of the few locally owned manufacturers who distribute their products nationally. One of its products—chain saws—is a national leader in sales. Truly a production show-place, the McCulloch plant was built in 1946 and expanded considerably in 1951. Working conditions are outstandingly good.

The company makes extensive use of magnesium and aluminum die castings in its products. The die casting shop is the heart of the manufacturing operation, all production being geared to that shop. Nine die casting machines are used for magnesium, six for aluminum. Each machine has its own electric holding furnace—induction units for aluminum, and specially designed resistance furnaces for magnesium. Breakdown of metal is also done in electric furnaces, with holding furnaces hot charged by electrically heated transfer pots mounted on fork trucks.

A more detailed discussion of McCulloch's operations was presented in FOUNDRY for May, 1954.

**Kwikset Locks Inc.** is one far western manufacturer able to compete in a long-established mass-production market. Organized in 1946, it is

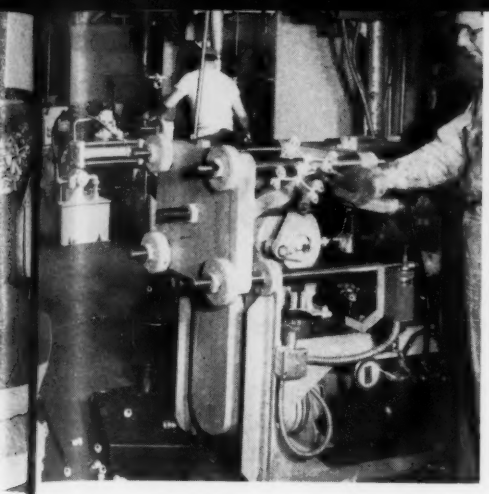


Fig. 12 — Gates of large zinc die castings at Kwikset are so thin that women can separate them from pieces by hand

holding its own in a field long dominated by a few old-line companies. Its secret? It is located in the middle of the biggest home building boom that has ever hit the U.S.A.

Pioneering the use of powder metallurgy parts in locksets, the company was able to cut costs considerably and had no trouble in competing with the old timers. Then it began development work early in 1954 on die casting zinc ornaments, cranks and door handles for the automotive industry. Soon it was supplying parts for western and southwestern auto assembly plants. It also has taken on some government die casting work.

Indicative of the quality of the company's die castings is a threaded plug. The threads are sharp and there is no flash on the parting line. Two operations—die casting and cutting the plugs from the gate—and the plugs are ready for use.

Skill in die making is also demonstrated in the die castings made for the locksets. An example is the cluster of zinc latch bolts shown in Fig. 14. There are 12 latch bolts on one cluster, and the gate to each one is only 0.014-in. thick. By giving the sprue a good rap, the die casting machine operator is able to jar the latch bolts off and place the sprue and gate in the furnace. This is done during the semiautomatic cycle of the machine, and permits the operator to do the work of two people while producing an average of 300 shots an hour. The break between the piece and the gate is so clean that the latch bolts are ready for use after being burnished and plated. Practically all the die cast lockset parts are gated this way, though the heavier parts have a slightly thicker gate and need more than a slight jar to break them loose.

Another **Kwikset** innovation is the goose necks the company designed and built. These goose necks (the pump which fills the die automatically on semiautomatic machines) are installed at a 45-degree angle, utilize automotive cylinder rings and are hydraulically operated. Maintenance has been practically nil since they were installed. Advantages are extremely short nozzles, smooth and fast operation.

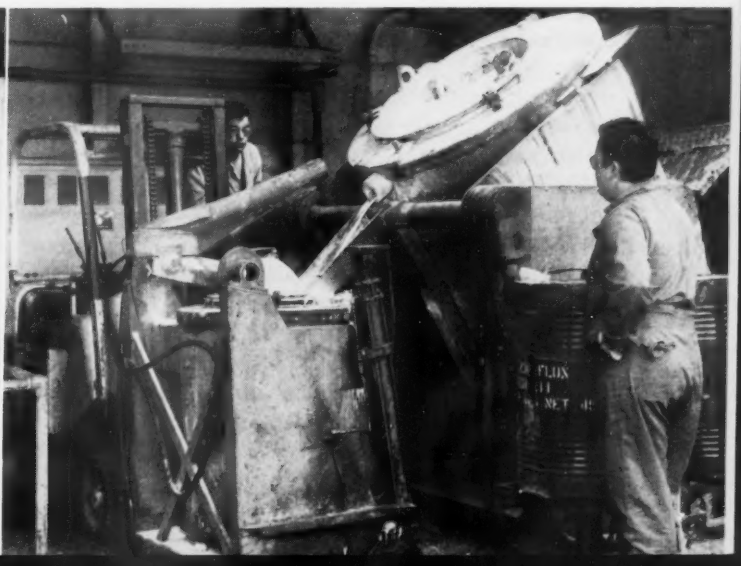
**Price Pfister Mfg. Co.,** producer of brass plumbing goods, also manages to hold its own in nation-wide sales. Smart operation makes the difference. One of its best operations is the die casting department. The department employs electric furnaces for melting, holding and standby for zinc, aluminum and brass. When the company moves into its new plant in the San Fernando Valley this year, it will have one of the most modern die casting shops in the country.

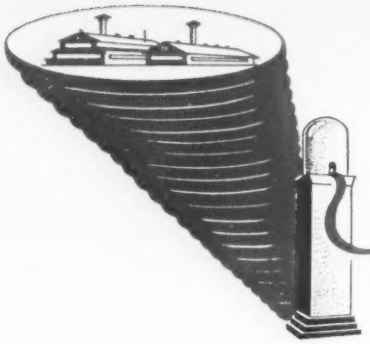
One of the few automatic pouring units for the production of aluminum die castings in the USA, and the only one in the far west, is in use at **General Controls Co.** The automatic pouring unit is basically an electric induction holding furnace, with an inclined discharge nozzle tube having its lower opening below the surface of the molten metal. The furnace is air-tight, and the metal is forced out of the furnace by building up the air pressure above the bath. Air pressure and pressure period are so regulated that accurately measured amounts are forced directly into the cold chamber of the die casting machine.

A semiautomatic cycle, assuring a constant time interval between pouring and injection, is provided by linking the controls of the pouring unit to those of the die casting machine. This has lowered the reject rate, maintained uniform casting quality, and increased production 25 per cent. Taking the molten metal from a point well below the surface in the furnace also contributes to better and more uniform castings.

Fig. 15—Specially designed electric magnesium holding furnaces are used by McCulloch Motors

Fig. 16—Hot charging at McCulloch Motors is done with transfer pots moved by fork trucks





# Any "Blue Chips"

*Some fundamental aspects of foundry management must be understood and corrected before the industry's financial problems can be solved. This is the opinion of a number of foundry executives whose views on what is needed to attract investors are consolidated in this article*

THE question "Shall I invest in the foundry industry?" cannot properly be answered with a mere "Yes" or "No." The answer is not so simple as a mere analysis of financial data. Many experts can analyze the return on invested capital for a number of years and conclude that a given foundry operation has been profitable or unprofitable. However, the nature of the industry and of the problems the future holds for it rule out such an easy approach.

Recent statements by two steel industry executives are at least partially relevant to the foundry industry as well as to their own.

E. L. Ryerson, chairman, executive committee, Inland Steel Co., predicted in a recent address that 200 million tons of steel capacity annually would be needed by 1980—an increase of over 60 per cent. As another basic industry, the foundry business should require a similar increase in capacity—provided it can hold its present markets and, perhaps, move into new ones.

Supplementing Mr. Ryerson's prediction, Ernest T. Weir, chairman, National Steel Corp., suggests that the steelmaking capacity of the nation "will have to be replaced entirely within a period of about 30 years" and that "a minimum of $30 billion will be required" for this purpose. Mr. Weir feels that the capital requirements involved cannot be obtained completely from earnings and that a large sum of "new money" will have to be obtained from the "public through the purchase of steel company bonds and equities." He went on to say that "a very definite change in the investment public's opinion of the industry" will be required.

Need for this change is occasioned by the attitude of investors that the steel industry, despite its obvious importance to the American economy, is "a risk—a speculation from the financial standpoint." According to Mr. Weir, the reason for this attitude is "that in the past, the record in the steel industry as to earnings and the payment of dividends has been uncertain and sporadic." Between 1928 and 1953, he stated, the earnings of the steel industry were below the average of those of all manufacturing industries in *every single year*. Comparable figures are not available for the foundry industry, but undoubtedly are no better.

**In the Same Boat**—Like the steelmakers, the foundry industry will need cash, whether from earnings or from investment, to maintain and to increase its capacity. But certain aspects of the nature of the industry make its chances of attracting investors seem even poorer than those of the steel companies.

For one thing, although cast metals is a giant in the national economy as a whole, the firms which comprise it are small. Even the larger units are Pygmies compared with the great steel companies. Number and value of shares in the average foundry are relatively small; this hurts the individual company's opportunities of borrowing money or selling shares. Moreover, most jobbing foundries—and it is the jobbing shops with which we necessarily must be concerned, of course—are privately owned and operated. Investment in them likely would require buying substantially all of the assets. And for many investors this would seem like putting too many eggs in one basket.

In addition, the castings industry, like steel, has tended to be highly cyclical. Facilities built up for periods of peak demand, usually for the national defense, lie fallow when demand slumps, just as steelmaking capacity does. Mr. Weir's remarks on this subject apply equally to casting producers.

Speaking of the need to maintain steel's capacity at a point high enough to meet peak demands, he said, "This is an obligation to steel consumers and to the country. *The cost of this obligation must be shared by the consumers of steel. Its burden should not fall exclusively on investors in the steel industry, which is a fact that steel management has overlooked in the past. The true cost of producing steel includes the cost of providing and maintaining all steel facilities and not just the part of those facilities that may be needed when steel requirements are below the capacity of the industry.*"

Where does this lead us? There are some disturbing indications that the number of ferrous foundries is dwindling steadily but surely. It is no secret that most foundries fail because of financial difficulties, often as a result of improper knowledge of, or attention to, computation of accurate costs. It is no secret either that the industry not only is cyclical in activity, but that price competition arises whenever the slightest depression in the demand for castings occurs.

# in the Foundry Industry?

**A Job To Be Done**—While there has been some tendency toward the development of a sounder pricing policy based on costs instead of demand, much still remains to be done. Some fundamental aspects of foundry management need to be understood and corrected before the financial problems can be solved. Several of those which need attention most urgently are:

1. The foundry industry needs more and better-trained technical personnel. Even more than metallurgists and process engineers, it needs salesmen who have the engineering training to do a competent job of designing castings suitable for a customer's needs. Then the foundry has to produce castings so designed, of good quality, at a competitive price. There is no longer room for a foundry which assumes that the price for a casting today is the same as it always has been, with direct adjustment upward for labor and material.

If the entire amount of these increases cannot be absorbed through raising prices, then, in order to maintain a profit level consistent with the concept of "investor confidence," a greater return must come partly from improved methods of production and the more efficient utilization of equipment.

Bringing down the cost of the product and improving the quality makes for expanded markets. New methods, processes, equipment and metals also are helping foundries to accomplish these goals, and efforts in this direction must be intensified, not slackened. Plant modernization, acquisition of better personnel, and better operating efficiency, all contribute to cost reduction.

2. Keen competition from other forms of fabrication also demands that the foundry industry maintain a continuing, intelligent effort to reduce costs. This will include greater attention to the problem of selecting and making the kind and class of work for which the foundry is peculiarly suited. With this decision goes a corresponding need to get rid of the kind of jobs for which the foundry is not suited and cannot be competitive.

3. The foundry industry needs a whole new concept of public relations. This does not mean that the industry needs some newspaper publicity or that any amount of advertising, plant visits, promotional literature or similar projects ever can do the job if the fundamental approach of management thinking is based on old-fashioned beliefs.

Casting producers traditionally have considered the problem of public relations to be more important to producers of consumer goods than to themselves. Part of the lack of "investor confidence" can be attributed to the assumption that we have no particular responsibility to or in connection with the general public because we do not make an end-use product. Perhaps this shortsighted policy has come home to roost in lack of knowledge about the basic importance of the foundry industry—and, perhaps more important, in a lack of confidence by investors.

**It's Time for a Change**—If the foundry industry seriously expects to remain in competition and to grow and expand as an industry should, it will have to rebuild its concept of public relations and set about educating the public as to the importance of castings. In doing so, it may be able to develop an appreciation in the investing public of the desirability and need of financing the growth and improvement of the industry.

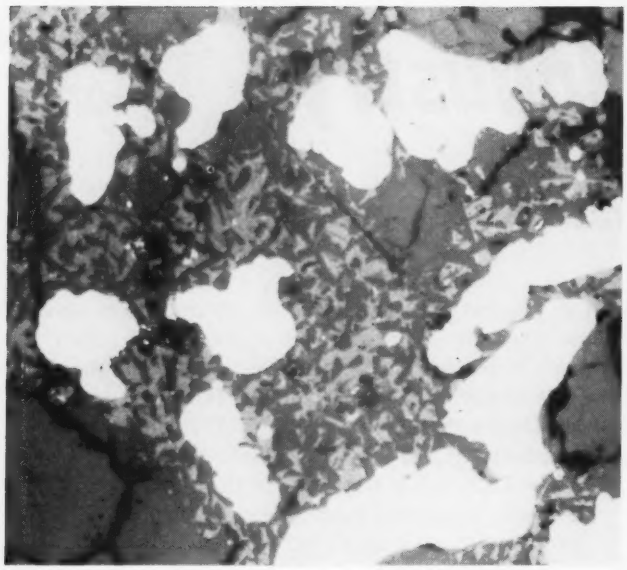
Building this confidence will require, first, a new concept of the industry's profit position. This end cannot be achieved overnight, but it is possible. It will be the challenge of the future to the leaders of the industry to bring about a reversal of the thinking in the industry which led to the present unhappy state of affairs.

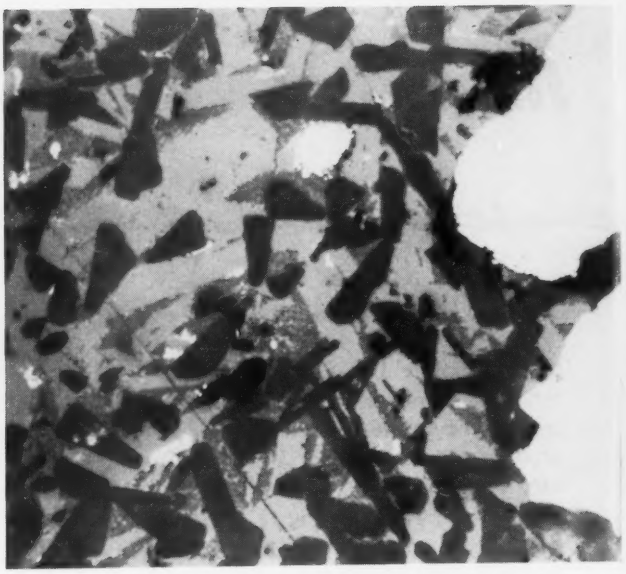
Speaking before the Los Angeles Rotary Club a few months ago, Elisha Gray II, president, Whirlpool Corp., said something which is particularly applicable to this discussion. "What good is a dollar profit," he asked, "if to score it you failed to reinvest the necessary dollars in engineering for future growth? What good is your dollar profit if you took it out of depreciation that should have been reinvested to keep your plant up-to-date? What good was your dollar profit if you didn't spend dollars to train new men who could grow to positions of command in your company and insure its continuing vigor?"

A prime ingredient of a company, from the standpoint of the investor, is management. The foundry industry cannot expect to prosper and grow—not, at least, on any scale comparable to that anticipated by the steel industry—if some foundrymen continue to ignore the principles of management which are applicable to other lines of business.

At the same time, numerous foundries have prospered in the past by avoiding the various shortcomings mentioned here. Many have spent large sums for modernization and mechanization and thus have kept abreast of the times. These companies have hired and trained competent executives and have done an aggressive job in promotion and selling. These companies are "leading the parade" today and can be expected to keep ahead of competition. Their records set a pattern of what it is possible for the industry as a whole to attain.

Yes, there are "blue chips" in the foundry industry, but there can and should be more of them!





Figs. 1a and 1b (left to right)—Penetrated sand shows ruptured sand grains, silica flour and tight cement of cristobalite. Quartz is dark gray, cristobalite (carrying some fayalite) light gray, metal white. 1a X115; 1b X450

# STEEL PENETRATION

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*Based on recent investigations, the authors suggest means of correcting penetration of molten steel into the mold surface. This paper was first presented before the 1955 Wisconsin Regional Foundry Conference*

MUCH excellent work has been done on penetration and methods of avoiding it, but enough penetration persists to justify further effort. This study has led to the following conclusions:

1. Most penetration takes place as a gas at temperatures within the pentrated sand below 1000° C (1800° F).

2. Additional penetration follows when the sand temperature approximates the melting point of steel. We believe, but do not know that this additional penetration is limited mainly to the front portion of the originally penetrated zone.

3. The fundamental cause of penetration is moisture in the sand. This has been known for some time; our results merely confirm it.

4. The main (gaseous) penetration depends on the presence of carbon monoxide in the sand, and this in turn is a consequence of the presence of moisture in the sand.

5. If the gas pressure is held down, neither moisture nor CO can bring about penetration.

Hence, an open face on a casting or a projection in which the sand cross-section is large enough to permit the escape of gases through the sand is an area where penetration is not expected. Permeability of the sand is of course critical. By contrast, an embayment in a casting such as the root area between the teeth of a pinion or, still more, a body of sand within a casting having limited escape channels for gases is an area where penetration is to be expected. If gas drainage from such areas can be provided to make up for the reduced cross-section of the escape area, protection is afforded from the danger of penetration there.

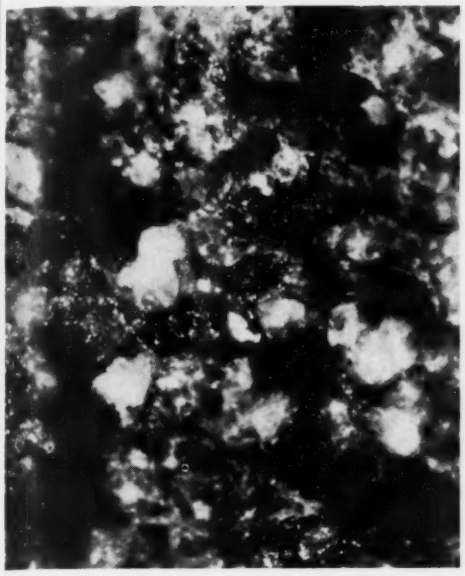


Fig. 2—Penetrated sand behind main wave of penetration shows wormhole-like channels formed by escaping moisture and hydrogen. X25. White is quartz, gray cristobalite and black areas interconnected channels

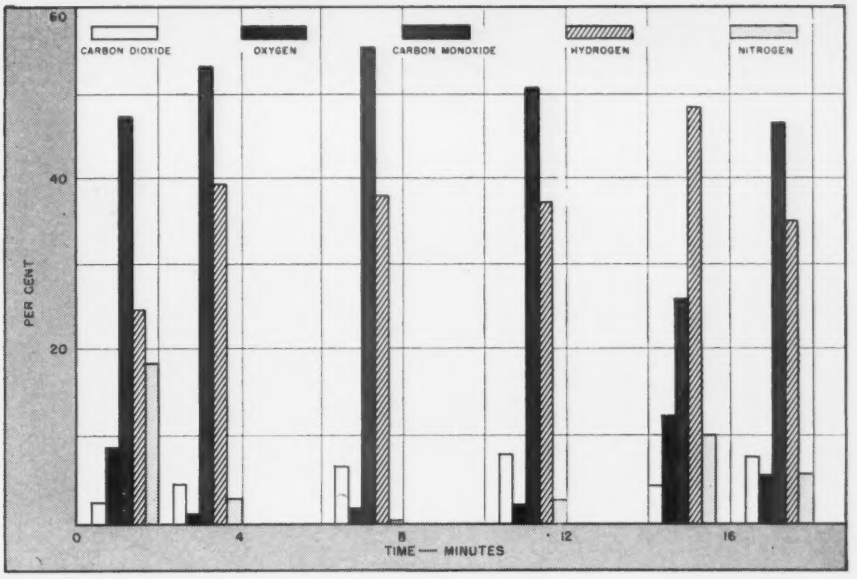



Fig. 3—Gas content of sand after a pour—the second group of Table I, except for the 1-2′ analysis, which is from first group. Hydrogen predominates in some, CO in most. These two gases almost exclude all others

**Critical Conditions within the Sand**—The commonly used mix of sand and silica flour provides small pores which essentially cannot be penetrated by molten steel. Penetration is contingent on the rupture of the steel meniscus between sand grains or on the reduction of the surface tension of the liquid. A high head of molten metal, as in a deep casting, may rupture the meniscus on the liquid, or large, unfilled pore spaces may lead to rupture. If the steel front is modified, as by oxidation, to permit the steel to wet the sand grains, the resultant destruction of the surface tension effect may cause the steel to penetrate small pores easily.

Since elemental iron as a molten liquid does not wet silica, penetration is inhibited as long as the liquid surface is protected from chemical modification. Molten steel has a surface tension of 1200-1500 dynes per square centimeter. This is three times the surface tension of mercury (465 dynes at 20° C), which will not penetrate sand readily. Since steel has three times the surface tension of mercury and half the specific gravity, it requires six times the head to break into a given pore, assuming it does not wet the walls. The odds are in favor of the operator.

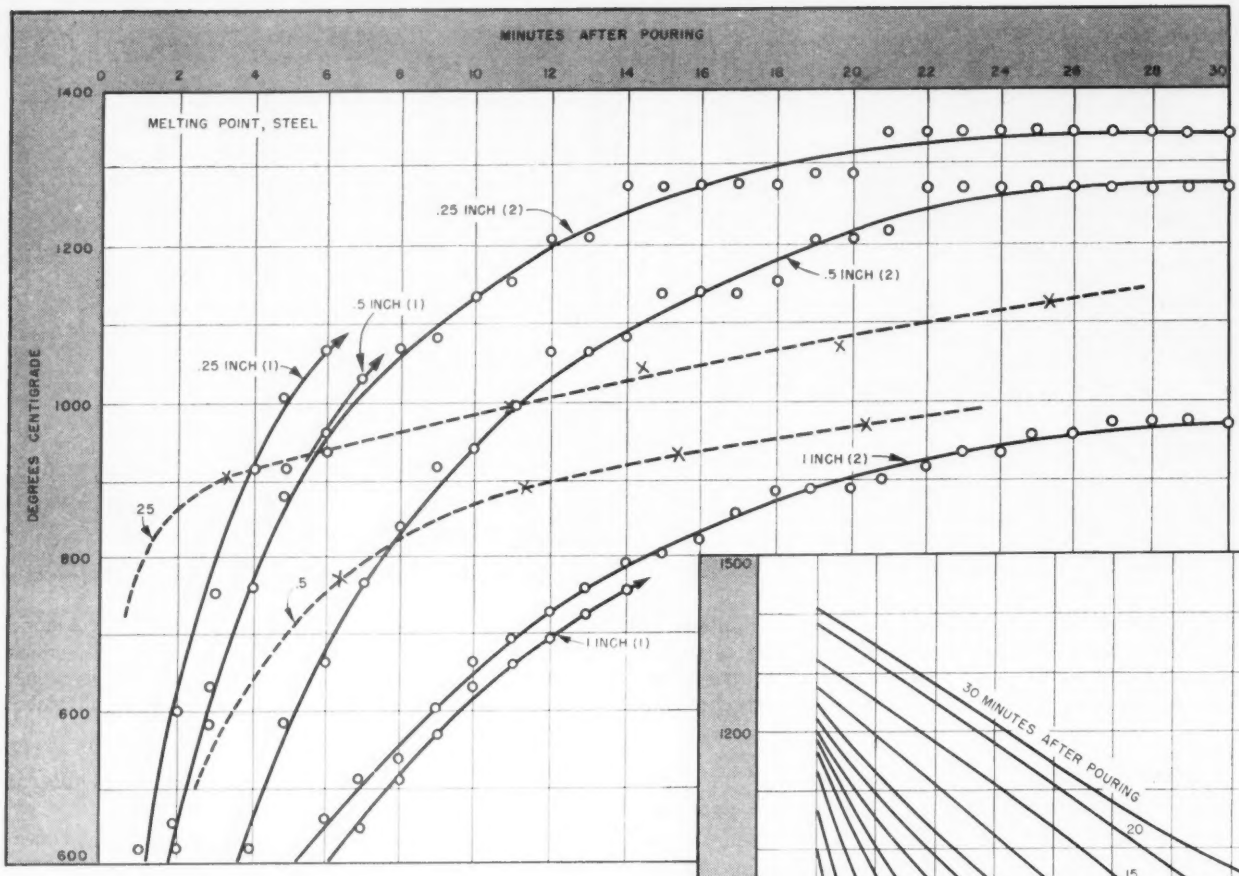
Optimum conditions in a sand mold include a modest excess heat over the melting point in the steel to maintain a high surface tension (surface tension is lowered with increasing temperature); a fine sand adequately permeable to gas; and a clean elemental metal surface, which is best maintained by a nonoxidizing atmosphere within the sand. The several variables are difficult to control even under the best laboratory checks. Although an ideally mixed sand is a museum piece rather than a production product, foundries have attained eminent success in sand mixing. The temperature of steel varies from heat to heat, but usually within accepted limits. But the atmosphere within the sand is taken for granted to a degree that seems not always to be justified.

In small, simple castings the margin of protection is usually adequate, but in large castings the margin is reduced by 1) higher metal and sand temperatures attained especially at re-entrants, 2) greater likelihood of carburizing, which reduces surface tension, 3) the head of molten metal, and especially by 4) greater reaction between metal and sand atmosphere. Since these reactions appear to be the outstanding causes of penetration, we have chosen to concentrate on them.

**The Room Problem**—A polished surface of penetrated sand (Figs. 1a and 1b) shows the metal occupying space formerly occupied by silica flour and the bonding ingredients of the sand. The displaced flour can be neither dissolved nor mechanically held by the metal. Therefore there is a mechanism for the removal of the flour and binder, prior to penetration, a mechanism which must be operative soon after pouring to permit the early penetration established below and referred to above.

Elliott, writing in 1952 on the transfer of silica, summarized earlier work, added his own on the gaseous hydrated oxides of silicon and demonstrated their volatility under conditions including those believed to prevail in sand. In the presence of water at high temperatures, especially under pressure, silica is soluble in steam. He stated, "In the presence of hydrogen the attack on the silica was much more severe." (p. 5). He believes that the volatilization reaction is $SiO_2(s) + 4H_2O(g) = SiO \cdot 4H_2O(g) + \frac{1}{2}O_2(g)$.

Silica hydrate is kept down by an oxygen atmosphere which forces the reaction to the left, but is increased by a hydrogen atmosphere. We shall note shortly that hydrogen is the second most abundant gas in a reacting sand atmosphere.



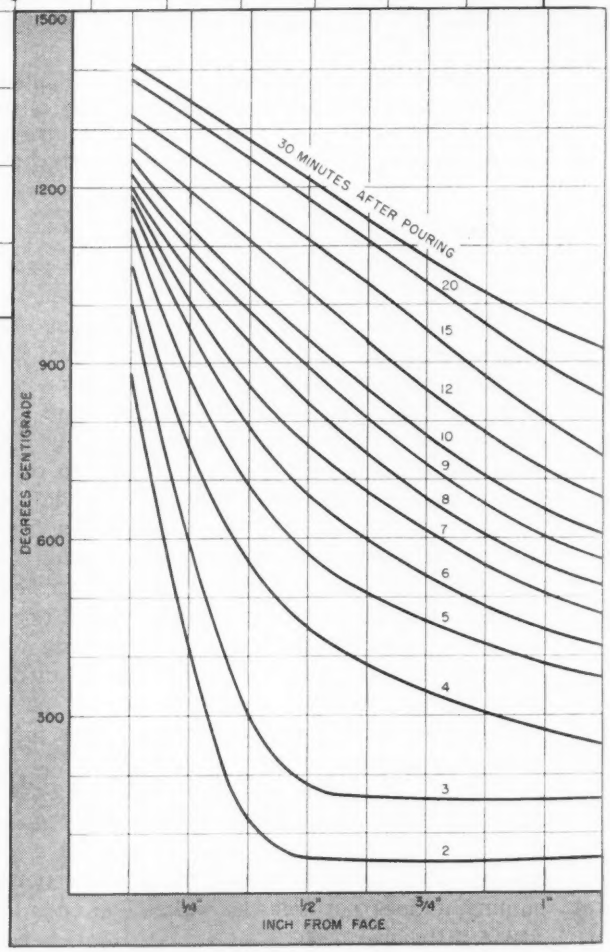




Fig. 4 (above)—Curves show temperature changes of sands in three molds. Short solid curves from data on thermocouples buried in sand. Beads apparently damaged by penetration. Long solid curves from data on thermocouples inside silica tubing in sand. Dashed curves from optical pyrometer readings through silica tubes buried in sand

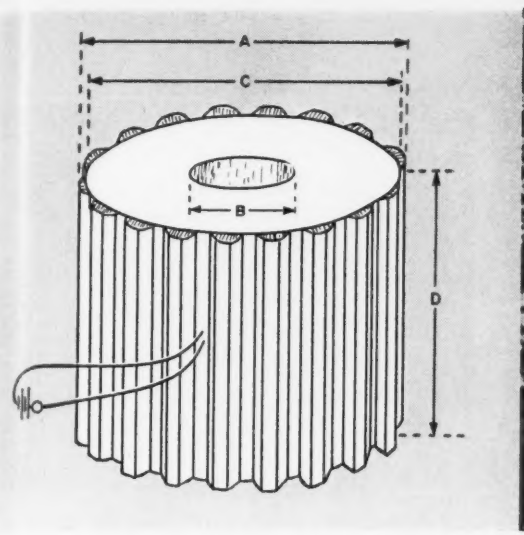
Fig. 5 (right)—Curves from same data as those in Fig. 4 show different aspect of temperature change with time

This established principle adequately explains the transfer of silica from the face region outward so that it is deposited as a cement of silica a short distance back, yielding a hardened sand. This solidly cemented sand may be seen in Fig. 1. The areas from which the silica is removed form channels which resemble worm holes in wood and have glazed walls. They may be seen in Fig. 2 or in fragments of penetrated sand.

These are the main voids which become filled with metal and give the effect seen in Fig. 1. Moisture in the sand and hydrogen, one of its decomposition products, are mainly responsible for opening up the sand to penetration. Since we shall show that most metal penetration takes place below 1000° C (1800° F), the removal of silica as a hydrate takes place first, at an even lower temperature. Other silica transfer as a hydride, at higher temperature, is probable, as will be suggested later.

**The Sand Atmosphere**—Silica tubes were placed in molds to extend from the sand-metal interface ¼ to ½ in. back, to the outside of the mold, where they were attached to evacuated flasks. In this way gas samples were taken at intervals after pouring. The results of three samplings are given in Table I and Fig. 3. Gas flow was strong in some samples, very meager in others. In those with a strong flow, carbon monoxide and hydrogen predominated. In those with a meager flow, air contamination seems evident in the high nitrogen content. In some samples the moisture content was so high that a flask was needed as a water trap before the gas was passed into the sampling flask. The variation was great, but two facts stand out—carbon monoxide and hydrogen are high.

Since in general nitrogen is low, we may as-



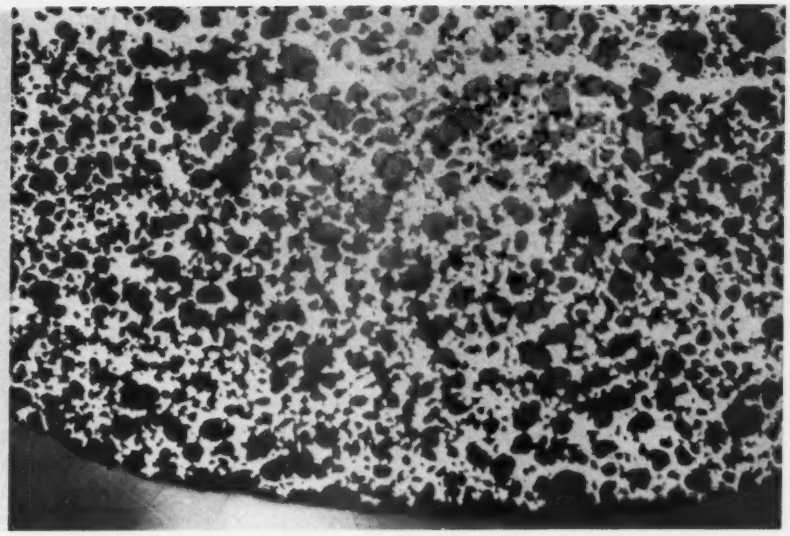



Fig. 6 (above)—Nature of flashlight wiring used to determine time required for penetration in a pinion. Dimensions: 1st casting—A, 23½ in.; B, 8 in.; C, 18 in.; D, 12 in. Weight, 960 lb. 2nd casting, A, 29 in.; B, 10 in.; C, 21½ in.; D, 16 in. Weight, 2000 lb
Fig. 7 (right)—Penetrated sand from pinion root area. Note lack of metal at face and vein cutting the sand

sume that air is low in the sand atmosphere immediately after the pour—probably driven out by the vaporized moisture. Carbon is abundant in the sand used in these castings and readily produces carbon monoxide by reaction with water vapor and any atmospheric oxygen remaining. Hydrogen is released by the reaction with water vapor, and some may appear from the oil used. The gases in sample 7′-8′, of Fig. 3, totaled 100.9 per cent, indicating a small amount of methane which was not sought in the procedure. It would appear in the analysis as carbon monoxide.

These gases are under considerable pressure, although no method could be conceived by us to measure it. Moisture is adsorbed on the sand grain surfaces and cannot be removed by ordinary baking. It is present also on the carbon in the sand, and in the sand used in these runs considerable carbon is present. Further, it is a prominent constituent of the bentonite used. Therefore sand, exclusive of green sand, contains considerable moisture. When some of this moisture is converted to steam, the familiar volume increase is a prominent cause of pressure buildup. The gas reactions also add to the pressure. Carbon combines with the oxygen of water to yield monoxide with no increase in volume. But released hydrogen is an additional gas, and the volume is tripled. Sand permeability is adjusted to control this pressure, or vents are provided. Even so, bubbles may form to testify to the reality of the pressure, which may be adequate to overcome the very considerable head of molten metal.

**TABLE I—Gas Analyses***

| | $CO_2$ | $O_2$ | CO | $H_2$ | $N_2$ |
|---|---|---|---|---|---|
| **Oct. 21 pinion** | | | | | |
| 1–2′ | 1.5 | 8.7 | 47.1 | 24.5 | 18.2 |
| 3–4′ | 2.6 | 7.3 | 46.4 | 30.1 | 13.6 |
| 5–6′ | 4.0 | 9.6 | 32.8 | 24.7 | 28.9 |
| 8½–9½′ | 5.0 | 9.0 | 31.6 | 22.1 | 30.3 |
| 15–16′ | 5.0 | 9.8 | 28.2 | 18.7 | 38.3 |
| **Oct. 29 pinion** | | | | | |
| 1–2′ | (1.1) | (16.8) | (18.9) | (4.2) | (59.0) |
| 3–4′ | 4.1 | 1.0 | 53.1 | 39.2 | 2.6 |
| 7–8′ | 6.2 | 1.5 | 55.2 | 38.0 | ... |
| 11–12′ | 7.9 | 2.0 | 50.8 | 37.1 | 2.2 |
| 14–15′ | 4.0 | 12.0 | 25.8 | 48.2 | 10.0 |
| 18±′ | 7.6 | 5.3 | 46.3 | 35.0 | 5.8 |
| **Pinion** | | | | | |
| 1–2′ | 6.7 | 2.7 | 34.8 | 55.3 | Tr. |
| 3–4′ | 7.8 | 0.8 | 32.4 | 59.2 | Tr. |
| 6–7′ | 8.7 | 2.7 | 31.5 | 57.8 | Tr. |
| 10–11′ | 8.4 | 0.8 | 32.0 | 56.8 | 2.0 |
| 15–16′ | 9.2 | 1.0 | 31.8 | 57.0 | 1.0 |

Note: The stem on the flask of sample 1–2′ was broken in transit after the sample was taken. This analysis though recorded is discarded. In figure 3, the values 1–2′ from the first analysis are used. The second analysis is believed to be more typical.

*By R.C.E.

**Sand Temperature**—Two methods were used to determine temperature within the sand. Thermocouples were placed in the sand ¼, ½ and 1 in. from the face. Thermocouples also were placed inside silica tubes which were sealed into the sand when the mold was formed. The tubes were spaced as stated above. The thermocouples at ¼ and ½ in. were platinum-platinum 10 per cent rhodium; the one at 1 in. was iron-constantan. The second method, used on a different type of casting, consisted of flattening the ends of two silica tubes and placing them ¼ and ½ in. from the face. The open ends, outside the mold, served as windows for direct optical measurements with an optical pyrometer. Results are given in Figs. 4 and 5.

The bare thermocouples embedded in sand at ¼ and ½-in. ceased recording at 6 and 7 minutes respectively. Readings were discontinued on the iron-constantan thermocouple at 14 minutes.

Thermocouples enclosed in silica tubing undoubtedly had a lag in temperature, the amount of the lag being unknown. However, 100° C (200° F) more or less is entirely reasonable and would bring the sand up to the temperature of partly molten steel. This point will be discussed further.

**Timing Penetration**—To time penetration, we used a simple device (Fig. 6) consisting of two wires spaced about ¼-in. apart, and ¼-in. from the face, extended through the sand to the outside of the mold, where they were connected in series to a battery and a flashlight bulb. Others were placed

Fig. 8 (left)—Same specimen shown in Fig. 7 after it had been etched to bring out difference in composition between the vein and the other penetrated metal

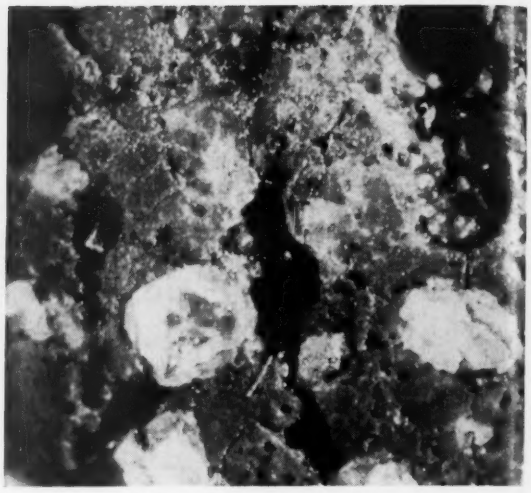


Fig. 9 (right)—Sand cut from a foundry test cylinder penetrated by iron silicate formed in atmosphere of moist nitrogen. X25. White is quartz, gray is cristobalite with fayalite, and black is cavities which are lined with fayalite

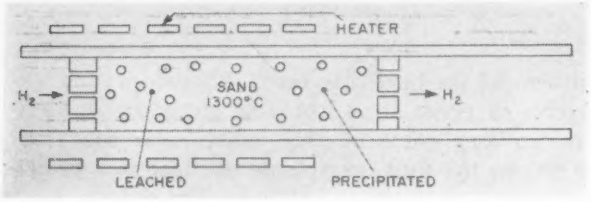



Fig. 10—Diagram of apparatus used to form hydride

½-in. and ¾-in. from the face. This was done in two pinions, the three being spaced from the root area. In one pinion a control was placed on the crest of the tooth where no penetration was expected or found. Penetrating metal closed the circuit to light the bulb. Iron silicate and carbon have lower conductivity and give a low glow. Sand is, for the purpose, an insulator.

In a 4000-lb pinion (shipping weight 2000 lb), the ¼-in. connection lit the bulb dimly at 9 minutes and to full brightness at 15 minutes. The ½-in. connection (at a different spot) lit the bulb dimly at 8 minutes and fully at 12 minutes. The ¾-in. connection lit the bulb dimly at 14 minutes and brightened, but not fully, at 20 minutes. At 40 minutes there was no change.

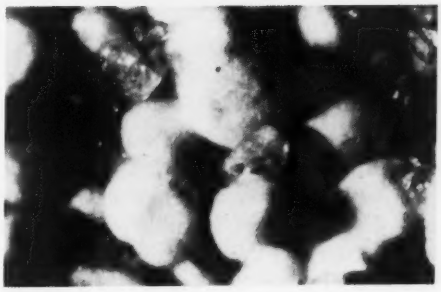
In an 1800 lb pinion (shipping weight 956 lb), the ¼-in. connection lit the bulb dimly in 6 minutes and fully in 8 minutes. The ½-in. connection lit the bulb dimly in 8 minutes and brightened but not fully at 14 minutes. The ¾-in. connection duplicated the ½-in. connection in timing. The control which was ¼-in. from the crest of a tooth lit very dimly 52 minutes after pouring. (Observations by J. B.)

If we assume that initial lighting of the bulbs was caused by formation of carbon and iron silicate, with metal penetration taking place when the bulbs lit brightly, we find by comparing the data given in this section with the temperature-time curves of Figs. 4 and 5 that penetration is irregular, but in these castings took place at about 1000° C (1800° F). If we further compare the cessation of operation of the two bare thermocouples, best explained by metal penetration, we again arrive at the approximate figure of 1000° C.

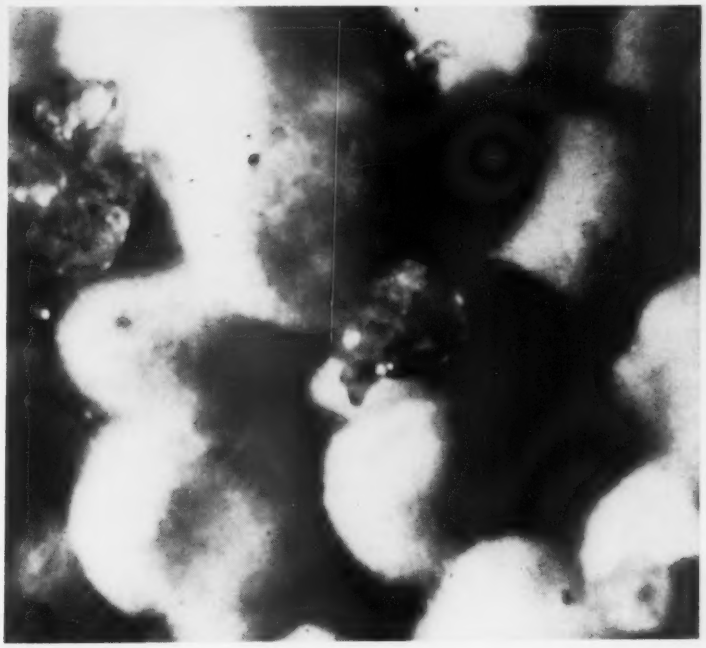
This conclusion that metal penetration takes place on a large scale, when it occurs at all, at or about 1000° C is supported by other lines of evidence too. There are two distinct and different temperature curves in sand—one for penetrated sand and another for unpenetrated sand. In Fig. 4 the ¼ and ½-in. curves reflect the high conductivity of metal-bearing sand including the high final values approximating the melting point of the steel. The 1-in. curve has the slope of metal-free sand.

Two other curves in the same figure, in dashed lines, represent the temperature values made on an unpenetrated 1250-lb casting with an optical pyrometer. Except for the expected initial temperature rise on the ¼-in. position under 2 minutes, these curves are similar to the 1-in. curve of the pinion, made in unpenetrated sand. The capacity for heat transmission is lower in the unpenetrated sand. In the penetrated sand the conductivity is sufficient to lead to the melting point and to permit a second stage of penetration, this time by molten metal. Evidence that this is true will be offered directly.

**Carbonyls**—This group of compounds is outside our everyday experience and in fact has not been so well explored by the chemical fraternity as we could wish. Perhaps the best known member is the iron carbonyl $Fe(CO)_5$, which is formed at low temperature and high pressure and is destroyed at increased temperature to precipitate metallic iron. The essential condition for its formation is that iron be heated under pressure in an atmosphere of carbon monoxide. Not all metals form carbonyls. Nickel, chromium and vanadium do. Molybdenum does, but only at very high pressures. Manganese does not, at least not under conditions of interest here. The method is used commercially to purify iron for magnet cores. For our purpose, pressure is essential. If the pressure is favorable a low temperature gaseous iron compound is formed in molding sand by the reaction of carbon monoxide, the dominant gas of the sand atmosphere, with the steel to produce a gaseous transfer of iron away from the face. The data cited indicate that the destruction of the iron carbonyls is probably complete at 1000° C, at



Figs. 11, 12 and 13—Sand grains coated by fibrous cristobalite deposited from silicon hydride. When the sand was removed from the tube, some of the etched grains which yielded silica were caught in the coating and appear as transparent, glassy grains. Figs. 11 (left) and 12 (lower left) from different runs; Fig. 13 is enlargement of part of 12. Fig. 11, X25; 12, X25; 13, X100



which temperature the sand conducts both heat and electricity.

But another test is available in that iron forms a carbonyl, as nickel and chromium do, but manganese does not. In the castings studied, manganese is present to plus or minus 1 per cent. The penetrated metal within the sand should theoretically have essentially no manganese in it at the time of penetration—about 10 minutes after pouring. Any manganese in it must be the result of steel penetration which follows later when the temperature rises as a result of the heat conductivity imparted to the sand by the early metal (carbonyl) penetration. Therefore the metal in the sand must be lower in manganese than the steel in the casting is. Some fragments of penetrated sand were heated to recover the metal in them and the metal was analyzed by x-ray fluorescence. Since no internal standard was used, the results are given in scale units rather than in percentages. The figures given in Table II are to be regarded as ratios. Without exception, the manganese content of the metal in the sand is one-half or less that of the steel. Nickel and chromium have accompanied the iron. Probably this may be used as a measure of the proportion of metal which came in as a carbonyl at low temperature and of the proportion which came in at the melting temperature.

Two further observations were made. Veins which cut across penetrated sand (Fig. 7) are common occurrences. One of these was sufficiently separate from the sand that it could be removed,

**TABLE II—Metal Composition Stated in Relative Scale Units of X-ray Fluorescence**

| | Mn | Ni | Cr | V | Mo | Reference |
|---|---|---|---|---|---|---|
| 1. Steel | 73 | 17 | 4 | 0 | 0 | Block 3151 |
| Metal in sand | 38 | 20 | 4 | | 0 | Serial No. D954 |
| Vein in sand | 24 | | | | | 1/4/55 Heat No. 1 |
| 2. Steel | 48 | 19 | | | | 3 A Test casting |
| Metal in sand | 21 | 21 | | | | |
| 3. Steel | 52 | 15 | 4 | 0 | 0 | Pinion CC 18434 |
| Metal in sand | 19 | 18 | 3.5 | | | Serial No. A 525 |
| | | | | | | 10/29/54 Heat No. |

Percentage Composition
Steel No. 1 .82
Steel No. 3 .80 .07

**TABLE II SUPPLEMENT (METAL COMPOSITION, %)**

| | Mn | Cr | Ni | Mo |
|---|---|---|---|---|
| 1. Steel | .82 | .033 | .13 | .03 |
| Metal in sand | .14 | .036 | .13 | .02 |
| Vein in sand | .33 | .029 | .13 | .03 |
| 2. Steel | .78 | .061 | .08 | .. |
| Metal in sand | .40 | .017 | .08 | .02 |
| 3. Steel | .73 | .026 | .08 | .03 |
| Metal in sand | .32 | .01 | .14 | .04 |

Analyst: K. R. Klumb

not cleanly, but with enough freedom from penetrated sand which it traversed that the vein material was dominant. It was analyzed and found to be still lower in manganese. The vein itself, could it have been separated clean of sand, theoretically would have indicated a carbonyl breakdown product. As a further check, the specimen shown in Fig. 7 was etched with hydrochloric acid. The results were striking, as shown in Fig. 8. The vein resisted the etch very well. At intermediate stages of etch, fingers of apparent steel penetrate along the channels of earlier metal (carbonyl) penetration.

The second additional observation also is significant. Molten steel will not wet silica unless it

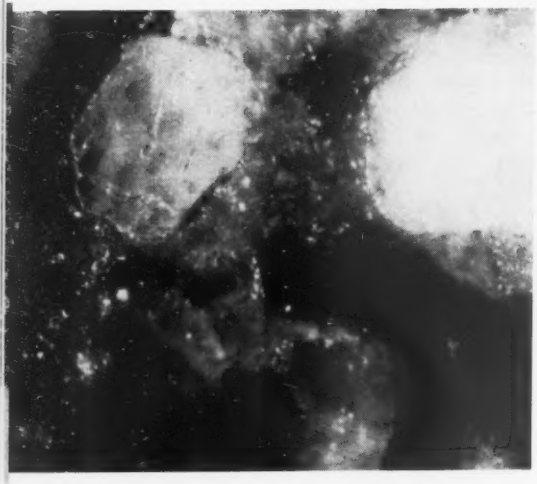


Fig. 14—Polished surface of penetrated sand shows individual grains converted to cristobalite on cutside of grain. Inclined illumination, X85. Quartz appears here as white; cristobalite, colored by fayalite, as gray, and the black is metal and fayalite

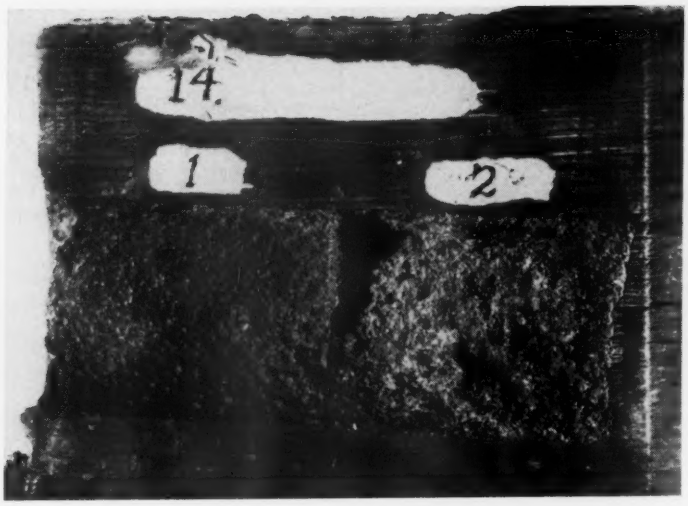



Fig. 17—Test casting two units high was separated by cement of low gas permeability. In lower unit, gases could escape and penetration is negligible. In upper unit, gases were trapped, and penetration is heavy

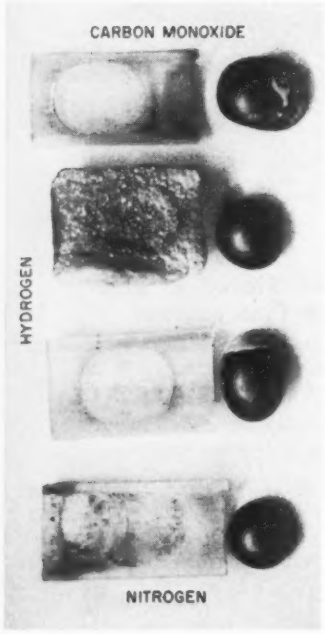



Fig. 15—Cubes of steel formed nonwetting buttons when melted in reducing atmospheres and in contact with silica

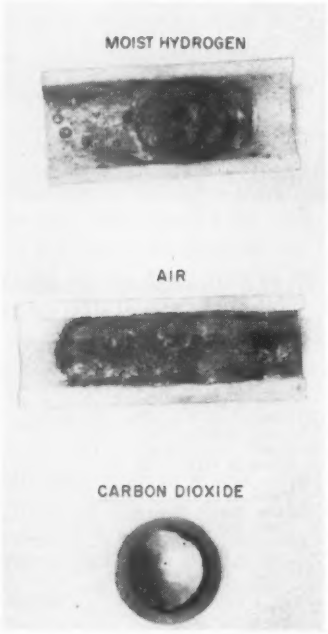



Fig. 16 — In oxidizing atmospheres, cubes of steel wet silica, react with it and eat into it through containing tube

contains wuestite (FeO), as is brought out below, nor can it penetrate an unopened (by hydrate or hydride formation) sand under ordinary foundry conditions because of its high surface tension. Therefore, as brought out in the next section, steel penetration either must follow a channel of earlier metal (ferrite) penetration or penetrate even a small pore if fayalite, which wets silica, precedes it.

In recovering the metal from penetrated sand, we heated the fragments to about 1500° C (2700° F) in a hydrogen atmosphere, and the metal "sweated" out of the sand and produced globules. The sand remained intact. If the metal had wet the sand, this behavior could scarely have been expected. Hence most of the penetration is not due to the oxidation of the steel, which would enable it to wet (react with) the silica sand. We believe this point lends further emphasis to carbonyl penetration.

An interesting though incidental feature of penetrated sand may be mentioned. Statements by foremen that pinion penetration usually is removed with considerable ease led us to examine the contact face of the sand (Fig. 7). There actually is a narrow zone along the face which contains very little metal indeed. It is probable that the small amount of metal in the contact face represents steel emplaced in the sand at its highest temperature, in contrast to the sand well-penetrated by carbonyl beyond the face.

**Mineralogy of Penetrated Sand**—Because elemental molten iron will not wet silica, it maintains a high surface tension across a pore opening lined with silica. But ferrous iron oxide (wuestite) wets silica readily and therefore may lead molten iron into such a small opening. A source of oxygen such as water vapor or carbon dioxide is conducive to penetration at high temperature. This is recognized as "oxide penetration" by some, and indeed it is initially, but it leads almost immediately to a chemical reaction between ferrous oxide and silica to form fayalite ($Fe_2SiO_4$), a low melting fluid silicate.

The formation of fayalite is due largely to the reaction of ferrous oxide with silica flour rather than with sand, which has less surface. The movement of fayalite is therefore tantamount to the movement of silica flour and contributes to opening up the pore space of the sand. The wetting and penetrating of sand by these products can be demonstrated by melting a piece of steel resting on sand in an oxidizing atmosphere (Fig. 9). Such penetrated sand is non-magnetic. Wuestite (FeO) and fayalite, although exceedingly fine-grained and

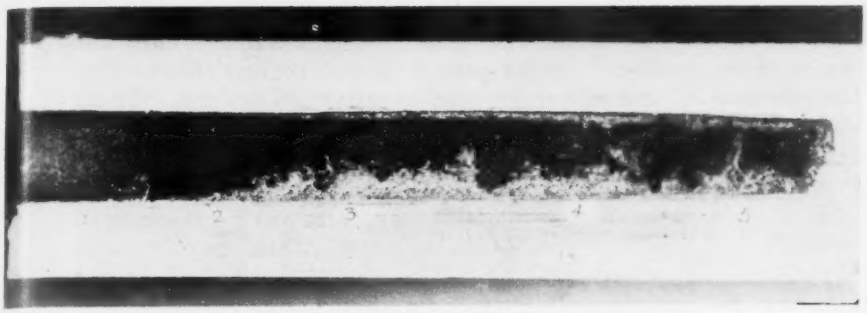


Fig. 18—A test with a casting five units high with a drainage tube in the middle failed for unknown reasons. In another test, the tube was closed by filled-in metal, and most penetration occurred on the inside. In a duplicate run, gas drainage by tube eliminated penetration. Left margin is outside and right margin inside of the casting at a saw cut. Light area of core is penetrated and hard. Dark is soft, charged with C

usually heavily admixed with cristobalite and other materials, do not elude a diligent search of penetrated sand. Many micro-sized specimens have been removed from penetrated sand, x-rayed and identified definitely. Still, they are not at all plentiful.

Study of the x-ray film and identification of the compounds was made by Prof. S. W. Bailey, department of geology, University of Wisconsin. He found that all samples were mixtures, with quartz and tridymite usually coarse-grained and cristobalite and the iron compounds fine-grained. Quartz, tridymite, cristobalite, fayalite, and magnetite were identified, as was wuestite. An unidentified compound present in small amounts was characterized by a powder line d-value of 7.1 angstroms, suggesting some type of layer lattice silicate. Hydrous iron silicates, such as greenalite, chamosite, or iron chlorite, would come in this category. Definite identification is not possible without concentration.

**Hydride Formation**—The formation of silica hydrates at low temperature has been stressed as the mechanism for making room for carbonyl emplacement. At the higher temperatures of the second penetration, another mechanism is probable for making room—the formation of silicon hydride ($SiH_4$, etc.). Above 1100° C (2000° F) silica in an atmosphere of hydrogen forms silicon hydrides which are highly mobile gases. The figure 1100° C is important since sand unpenetrated by carbonyl earlier does not, in our experience (Fig. 4), reach this figure soon enough after pouring to make room for molten penetration. But in penetrated sand of the first stage, the critical temperature is well exceeded.

Two types of laboratory runs were made in duplicate to parallel the principles outlined. Silica sand, without flour, was placed between permeable carbon plugs in a silica tube in an atmosphere of flowing hydrogen. A heating element was placed around one half of the filled portion of the tube to hold it at 1300° C (2400° F) for an hour. The gas flowed from the hot to the cooler end of the sand-filled portion of the tube (Fig. 10). The sand in the heated end became etched and glazed. The sand in the cooler end became coated (Figs. 11-13) with fibrous cristobalite, identified by refractive index, in the form of an interlocking fuzz. The extremely small fibers fit the description of lussatite by Laves (1939). Similar runs, using hydrogen which had been passed over hot water, gave no recognizable effect such as that of dry hydrogen.

Unknown to us is the amount of hydride transfer. In the sand (Fig. 14) surrounding the sand grains is a very considerable amount of cristobalite, some of it in needles. But its origin is an open question—there are several possibilities.

**Laboratory Tests on Surface Tension**—As already indicated, the most effective cause of modification of the surface of molten steel so that it wets silica is oxygen in the sand atmosphere. This converts the metal surface in part into ferrous oxide which readily combines with silica to form fayalite ($Fe_2SiO_4$), and this is wetted by molten steel.

In the laboratory, ⅜-in. cubes of carbon steel were heated in controlled atmospheres to check the chemcial reactions. Composition of the steel was 0.28-0.32 C, 0.75-0.85 Mn, 0.028-0.032 P, 0.038-0.045 S, 0.30-0.40 Si and 0.05-0.06 Ni. The cubes were melted in silica boats or on sand blocks which had been cut from test sands prepared in the foundry. Clean, nonwetting steel buttons, roughly spherical in shape, were formed on both fused silica surfaces and on sand surfaces in atmospheres of nitrogen, carbon monoxide and hydrogen (Fig. 15).

In oxidizing atmospheres, the melting cube soon begins to boil on its surface and continues to boil much like taffy as it melts. The liquid steel instantly wets the silica surface and spreads over it. In a tube it even covers the top of the tube above the steel. On a sand surface, the liquid soaks into the sand. The oxidizing atmospheres used were carbon dioxide, air and nitrogen which had been passed over hot, nearly boiling, water. These are illustrated in Fig. 16.

The product of this oxidizing reaction was x-rayed and found to be fayalite, $Fe_2SiO_4$. Ferrosilite ($FeSiO_3$) was anticipated and sought, but was not found. The fayalite is identical with that found in penetrated foundry sand, where no ferrosilite could be detected. In one experiment, the oxidized steel reacted so vigorously with the silica tubing that it ate through a ⅛-in. wall in a little over a minute.

**Test Casting**—As a foundry test of these principles, some test castings were made, by the method developed at the Department of Mines and Technical Surveys, Ottawa, Ont. (Gertsman, 1951). In each test the customary 2-in. control core was included and in each showed little or no penetra-

tion. Cores were placed end-to-end to build up units 2, 4 and 5 high, each 2 in. long. One 2-in. unit offers little cause for gas trapping. Two of these, shown in Figs. 17 and 18, bear out the relationship between depth of penetration and the remoteness of the gas-escape vent. In one of these, 5 units high, the penetration is mainly on the inside of the test block, rather than on the outside of the core nearest to the wall—presumably arrested on the outside by more effective chilling.

Special attention is called to the progressive increase in penetration in the 5-unit test, from the entrance to the top. We believe this to reflect the increase in pressure (required for silica hydrate and carbonyl formation) at the upper end, where the escaping gas must traverse the entire column. Following this lead, we twice attempted unsuccessfully to pour around a test core which extended from the bottom out the top of a 17-in. block. In both, the core shattered (Fig. 19). We believe it literally blew up under gas pressure, the gas forming the bubbles seen in the figure and releasing the pressure in the sand. The limited penetration in the fragments, although they are wholly surrounded by metal, is in harmony with this explanation. Heat alone cannot cause penetration.

Two more unsuccessful attempts were made to demonstrate the critical nature of gas pressure. Two test cores 6 in. high were set in a test casting 17 in. high. One core was vented each time by a hole through the core to its top. In each, the vented core was unpenetrated, but the unvented core shattered. We should like to think that this was to be expected, but it is not so convincing as an unshattered, penetrated core would have been.

**Green Sand**—We have not studied green sand and can make no intelligent remarks about it. It should be studied because it seems to have its own protection. In our laboratory runs on silicon hydride, moist hydrogen gave no transfer. Possibly moisture destroys the effectiveness of iron carbonyl also. The specific heat of water is high and gives to green sand a distinct cooling effect. The heat of vaporization of water is also high. These chilling effects may be sufficient to give green sand its degree of immunity.

**Corrective Suggestions**—Pressure is essential to the formation of silica hydrates and iron carbonyls. If they don't form, the first, low-temperature metal (carbonyl) penetration does not take place. If this early penetration fails, there is essentially no possibility of the second, high-temperature penetration taking place. Therefore anything that can be done to prevent the development of pressure near the face is a corrective measure. The permeability of sand is most important. Actual vents are recommended. We are planning to place ¼-in. rods in the sand, to be removed before pouring, leaving holes from critical areas for the escape of gases. The results will be reported later.

These recommendations are based on our study of a limited number of castings and must be applied to castings in general with tempered judgment.

**Acknowledgment**—This work was started under the joint sponsorship of the Employers Mutual Liability Insurance Co. of Wisconsin, Falk Corp. and the University of Wisconsin, with emphasis on the reaction of silica in foundry sand. Later the emphasis was changed to a study of penetration. All experimental and controlled castings were done in the Falk Corp. foundry. Laboratory runs were made in the geology laboratories of the university. Suggestions and advice were requested freely and given liberally by other Falk Corp. staff members and by other faculty members.

**References**

Elliott, Guy R. B., 1952. Gaseous hydrated oxides, hydroxides, and other hydrated molecules. University of California Radiation Laboratory, No. 1831.
Gertsman, S. L., May, 1951. "Penetration." FOUNDRY, p. 85.
Laves, F. 1939. Die Regelung von Quartz, etc. *Naturwiss.*, Vol. 27, pp. 705-707.

Fig. 19—In this casting, an unsuccessful attempt was made to cast a 1-in. core entirely through a 17-in. pour. The sand shattered and released bubbles to the steel. Both the bubble holes and the almost unpenetrated sand are significant

## Plans Near Completion for

# AFS

# HOUSTON CONVENTION

ARRANGEMENTS are nearing completion for what promises to be one of the most interesting national conventions of the American Foundrymen's Society. This 59th annual meeting, scheduled for May 23-27 at Houston, Tex., will offer several attractive features.

Of major importance are the more than 100 technical papers to be presented at about 50 sessions. These are in addition to a series of shop courses and nine roundtable luncheons. In preparation of the program, emphasis has been placed on practical subjects as well as on the broadest possible coverage of the newer technological developments in the industry.

Here are some of the high lights of the technical program:

*Malleable*—Two shop courses dealing with pearlitic malleable iron and hot tearing, respectively.

*Sand*—A film and paper describing the carbon dioxide process for treating molds and cores.

*Gray Iron*—Papers discussing injection with calcium carbide, and shop courses covering inoculation of molten iron and efficient cupola operation.

*Light Metals*—Discussion of castings in airframe design, insulated risers and titanium-silicon alloys; a new film picturing fluid flow through vertical gating systems.

*Safety and Hygiene*—Demonstration of engineering methods for the control of noise sources.

*Heat Transfer*—The first Dr. H. A. Schwartz Memorial Forum on the subject of application of heat transfer principles to foundry practice.

Also outstanding on the program will be the Charles Edgar Hoyt Memorial Lecture. This year's lecturer, Fred J. Walls, International Nickel Co., Detroit, will speak on "Education and the Future Foundryman."

Registration headquarters will be at the Rice Hotel, where technical sessions will be held. Most of the other events are scheduled for the Shamrock Hotel.

## TENTATIVE MEETING PROGRAM

### MONDAY, MAY 23

9 am—Registration Opens
10 am—Technical Sessions: Brass & Bronze; Malleable
12 noon—Roundtable Luncheons: Brass & Bronze; Malleable
2 pm—Technical Sessions; Education; Light Metals; Sand
4 pm—Technical Sessions: Brass & Bronze Shop Course; Light Metals; Malleable Shop Course—"Pearlitic"
8 pm—Sand Shop Course—Gray Iron—"Fitting Sand Control to Your Foundry"

### TUESDAY, MAY 24

8:30 am—Registration Opens
9:30 am—Technical Sessions: Light Metals; Industrial Engineering; Brass & Bronze; Malleable; Sand
12 noon—Roundtable Luncheons: Light Metals; Education
2 pm—Technical Sessions: Safety, Hygiene and Air Pollution Control; Industrial Engineering; Brass & Bronze; Sand; Malleable
4 pm—Technical Sessions: Brass & Bronze Shop Course; Malleable Shop Course—"Hot Tearing"; Safety, Hygiene and Air Pollution; Light Metals
6 pm—Sand Division Dinner
6:30 pm—Alumni Dinner
8 pm—Shop Courses—Sand and Gray Iron—"Sand Preparation Without Guesswork"

### WEDNESDAY, MAY 25

8 am—Past Presidents' Breakfast
8:30 am—Registration Opens
9:30 am—Annual Business Meeting
10:30 am—Charles Edgar Hoyt Memorial Lecture. Speaker: F. J. Walls, International Nickel Co., Detroit
12 noon—Roundtable Luncheons: Pattern; Industrial Engineering; Gray Iron
2 pm—Technical Sessions: Refractories; Sand; Steel; Light Metals
4 pm—Technical Sessions: Plant & Plant Equipment; Gray Iron; Safety, Hygiene and Air Pollution Control; Pattern; Heat Transfer
7 pm—AFS Annual Banquet

### THURSDAY, MAY 26

8:30 am—Registration Opens
9:30 am—Technical Sessions: Gray Iron; Pattern; Sand; Steel
12 noon—Roundtable Luncheon: Steel; AFS Board of Directors Luncheon
2 pm—Technical Sessions: Sand; Gray Iron; Refractories; Safety, Hygiene and Air Pollution Control; Cost
4 pm—Technical Sessions: Gray Iron; Sand; Heat Transfer; Plaster Mold Casting
7 pm—Texas Chapter Night

### FRIDAY, MAY 27

8:30 am—Registration Opens
9:30 am—Technical Sessions: Gray Iron; Sand; Steel
2 pm—Symposium on Nondestructive Testing

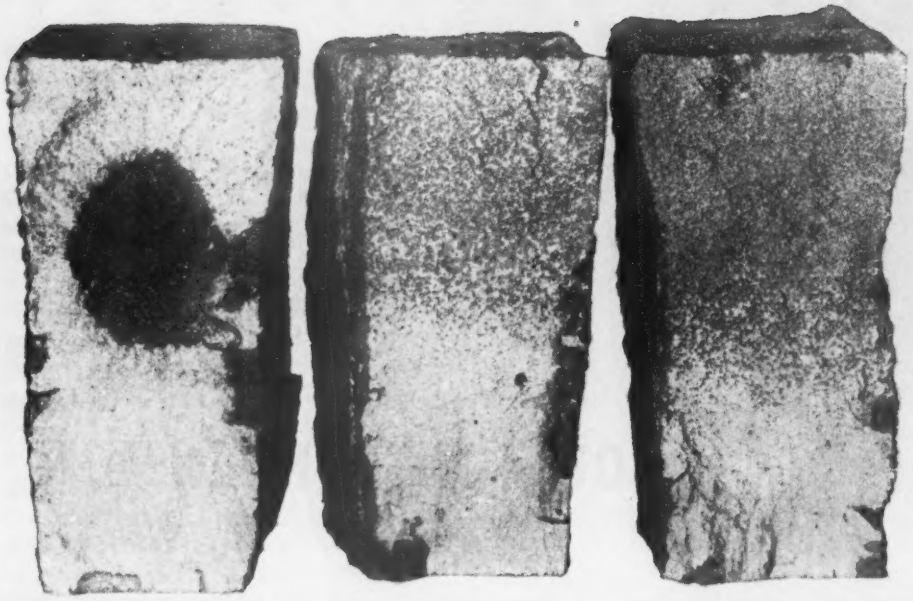


Fig. 1—Same heat of air furnace cast iron produced these chill-test fractures. Left, base iron showing solid chill with a dark shrinkage cavity. In center, iron with addition of 0.2% titanium. Right, with addition of 0.4% titanium. Reduced in duplication*

# Titanium in Cast Iron

*Titanium's influence on various properties of cast iron are discussed here. The article is one chapter from the author's recently published book, "Titanium in Iron and Steel," and is reproduced by permission of the publisher, John Wiley & Sons Inc., New York*

By GEORGE F. COMSTOCK
*Consultant*
Titanium Alloy Mfg. Division
National Lead Co., New York

AS EARLY AS 1909 it was observed by Moldenke[1] that titanium acts as a graphitizing agent in cast iron, and in 1927 a patent ( U. S. Patent 1,636,657) was granted to H. A. Schwartz on the use of titanium instead of silicon to promote the graphitization of white iron. The graphitizing effect of titanium on white iron has been confirmed by several other investigators,[2, 3, 4] so that there can be no doubt as to its reality, in spite of the apparent contradiction between this action and the equally well established fact[5, 6] that titanium forms an exceptionally stable carbide.

It is surprising that this peculiar combination of effects has not provoked more comment in the literature. The most reasonable explanation is that, whereas most carbide-forming elements such as chromium, vanadium, molybdenum, tungsten, and manganese restrain graphitization or stabilize cementite by forming double carbides with iron, titanium does not form a double carbide with iron but forms a carbide that separates from austenite or from molten iron at a temperature far above that at which cementite or graphite is formed. The graphitizing action of titanium is probably due to deoxidation, and the element resembles the other deoxidizers, silicon and aluminum, in this respect. Graphite, of course, cannot be formed by decomposition of titanium carbide.

*Figs. 1, 2, 3 and 4 from *The Effect of Titanium on Cast Iron*, Titanium Alloy Mfg. Co., New York, 1945.

It has been noted that the chief effect of small (less than 0.025 per cent) additions of titanium to steel is deoxidation, and the same is true of small additions to cast iron. Nearly all cast iron, however, contains from about 0.02 to 0.05 per cent titanium, introduced by the regular raw materials used in its manufacture, so that the "small" additions effective for deoxidation and graphitization of cast iron are in the range of about 0.1-0.4 per cent. There is so much more carbon in cast iron than in most steels that the quantity of carbon fixed as titanium carbide by such amounts of titanium is insignificant in cast iron, although this is not true for similar amounts of titanium in steel.

As was disclosed by Schwartz, titanium is a more powerful graphitizer for white cast iron than silicon, about 0.1-0.15 per cent titanium being equivalent in effectiveness in this respect to about 0.7 per cent silicon. Quite small titanium additions may thus be sufficient to produce some graphite, or "mottling" of the fracture, in chilled-iron castings which are intended to be hard white iron. This is illustrated by Fig. 1. Since such mottling is usually not desired in white iron, titanium is not often added to that grade.

Another result of the presence of titanium in white iron, as well as in all other ferrous alloys containing carbon, is the occurrence in the microstructure of small angular crystals of titanium carbide, such as are illustrated in Fig. 2. Although these crystals can be found in polished microsections of almost any cast iron,[7] they are noticeably more prevalent after a titanium alloy has been added.

As a result of a nucleating effect of these crystals, which form in the melt before the iron solidifies, a finer grain size is often produced in white

Fig. 2—Typical pale angular crystals of titanium carbide in cast iron which has been treated with 0.4 per cent titanium. X500, not etched*

cast iron, giving rise to some improvement in strength and toughness.[1, 8]

**Titanium in Malleable Cast Iron**—Most attempts to use titanium in malleable cast iron have resulted sooner or later in finding that primary flake graphite is produced in the white iron as cast, before it is annealed, with a consequent impairment of the ductility. This could probably have been avoided by suitably decreasing the silicon content to compensate for the graphitizing effect of the titanium added, but the foundrymen making the trials were generally unwilling to risk upsetting their annealing results by a drastic change in silicon.

**TABLE I—Properties of Titanium-treated Malleable Iron***

| Titanium Added, % | Tensile Strength, psi | Yield Point, psi | Elongation, % |
|---|---|---|---|
| 0.015 | 55,100 | 39,600 | 20.6 |
| 0.03 | 55,100 | 37,900 | 20.5 |
| 0.09 | 55,000 | 36,650 | 21.0 |
| 0.12 | 55,500 | 36,200 | 21.25 |
| 0.18 | 56,100 | 37,350 | 21.7 |
| 0.24 | 56,000 | 38,800 | 21.5 |
| 0.27 | 53,000 | 37,550 | 14.5 |

*Heine.[12]

**TABLE II—Effect of Titanium on Some Mechanical Properties of Gray Cast Iron***

| Melting Process | Ferro-titanium Added, % | Composition, % C | Si | Ti | Transverse Test (1.25-in. diam, 12-in. span) Maximum Load, lb | Deflection, in. | Tensile Strength, psi | Brinell Hardness |
|---|---|---|---|---|---|---|---|---|
| Cupola | 0 | 3.58 | 2.12 | 0.048 | 2623 | 0.163 | 17,550 | 163 |
| | 2 | 3.68 | 2.36 | 0.228 | 3639 | 0.177 | 27,050 | 187 |
| Indirect arc | 0 | 3.09 | 2.17 | 0.053 | 4030 | 0.125 | 33,850 | 190 |
| | 5 | 3.18 | 2.21 | 0.156 | 5220 | 0.180 | 40,000 | 196 |
| Crucible | 0 | 3.44 | 1.82 | 0.060 | 4142 | 0.137 | 30,950 | 163 |
| | 1 | 3.40 | 1.86 | 0.093 | 4313 | 0.125 | 33,600 | 225 |
| | 2 | 3.44 | 2.08 | 0.232 | 4427 | 0.102 | 40,150 | 189 |

**Alloy Cast Irons*, AFS.

**TABLE III—Compressive Strength and Hardness of High-carbon Titanium Cast Irons***

| Composition, % TC | CC | Si | Ti | Crushing Strength, psi | Brinell Hardness |
|---|---|---|---|---|---|
| 3.88 | 1.35 | 1.22 | 0.038 | 130,000 | 225 |
| 3.84 | 0.81 | 1.15 | 0.094 | 120,000 | 189 |
| 3.80 | 0.98 | 1.08 | 0.516 | 138,000 | 215 |
| 3.89 | 0.60 | 1.65 | 0.066 | 66,000 | 108 |
| 3.84 | 0.59 | 1.94 | 0.119 | 90,000 | 137 |
| 3.88 | 0.63 | 1.73 | 0.251 | 94,300 | 148 |
| 3.62 | 0.30 | 2.69 | 0.068 | 57,800 | 97 |
| 3.75 | 0.56 | 2.69 | 0.118 | 78,000 | 118 |
| 3.63 | 0.41 | 2.66 | 0.353 | 118,000 | 164 |

*Piwowarsky.[2]

It has been reported that additions of up to 0.5 per cent titanium, even when less than 0.1 per cent is retained,[9] promote a finer grain and finer graphite nodules in malleable iron castings.[10] An experimental investigation[11] to confirm these reports indicated a ferrite grain refinement from about No. 3 or 4 to No. 5 or 6 on the standard ASTM scale by titanium treatment, with a correspondingly finer graphite nodule size, but without a notable effect on the tensile properties.

A careful investigation of the effects of titanium and of other strong deoxidizers on malleable iron[12] has furnished additional confirmation of graphitization and grain refinement by titanium, as well as data on the effects on inclusions and tensile properties. Eutectic sulphide inclusions were found to impair the ductility, as in steel castings, when too much titanium was added. Representative data are given in Table I.

**Effect on Microstructure of Gray Iron**—Gray cast iron is so named after the color of its fracture, which is darkened by graphite in contrast to the bright crystalline fracture of white iron containing no graphite. Chemically, the major distinction between the two grades is the presence of from 1 to 3 per cent silicon in gray iron and less than 1 per cent in white or malleable iron. Of course, the rate of cooling is also a major factor in determining whether a given cast-iron casting, or a part

of a casting, is gray or white iron, and many castings with as much as 2 per cent silicon or more may be "chilled" or white at corners or thin sections where cooling was too rapid. This is generally very objectionable in gray iron, since such chilled portions are so hard as to be almost unmachinable. Titanium is sometimes added to prevent hard spots due to chill, since a small addition promotes graphitization at cooling rates that, without titanium, might suppress it.

The most striking effect of titanium on gray cast iron is a reduction in the size of the graphite flakes, and in this respect titanium is more potent than any other alloy addition. A titanium cast iron can generally be recognized by the uniform, dull, sooty appearance of its fracture, whereas gray iron normally shows a fracture with shiny black spots in the interior due to coarse graphite flakes. This difference is illustrated by fracture photographs in Fig. 3 and by photomicrographs of unetched polished sections in Fig. 4. An exaggerated example of the refinement of graphite brought about by the use of carbon dioxide gas with titanium[13] is presented from the work of Norbury and Morgan[14] in Fig. 5. In England it was claimed that this gas treatment, as well as a titanium addition, is required for effective refinement of the graphite flakes in gray iron, but in America results such as those illustrated by Figs. 3 and 4 have been obtained regularly with the addition of titanium alone.

Several theories have been proposed to account for the finer graphite in titanium cast irons, some of them[14, 15] based on the assumed presence of slag inclusions in the iron. Silicates of relatively high melting point were thought to be required as nuclei for the formation of coarse graphite, and titanium in an oxidized form was supposed to remove the slag or render it so fusible that the nuclei were absent. Subsequently, however, Morrogh[7] has shown very clearly that silicate inclusions are not ordinarily found in cast iron and cannot therefore explain any differences in structure. A more plausible explanation, based on undercooling of the melt or failure to solidify at the expected temperature on cooling, was proposed by Boyles and Lorig[16] to account for the occurrence of abnormally fine graphite flakes. This theory has been rather generally accepted, although the exact reason why titanium promotes the undercooled graphite structure is still obscure. Boyles has shown that hydrogen and sulphur tend to produce abnormally coarse graphite in cast iron,[17] but the mechanism of this action is also not thoroughly understood.

Other modifications brought about by titanium in the microstructure of gray cast iron are an increase in the prevalence of fine angular titanium carbide crystals, which, as has been noted, are found to some extent in almost any cast iron, and, in irons whose chemical composition permits the occurrence of any ferrite, an increase in the amount of ferrite. The latter effect is due chiefly to the graphitizing influence of titanium but also in part to the fixing of some carbon as titanium carbide.

**Effect on Strength, Hardness and Machinability**—On account of the finer graphite flake size produced by titanium in gray iron, strength and hardness are generally increased by additions that raise the residual titanium content to around 0.1 or 0.2 per cent. The greatest improvement in strength is found in irons of relatively high carbon content, where the influence of the graphite is predominant. Some typical data are presented in Table II. Fine-grained, low-carbon, high-strength cast iron may, however, be weakened by titanium because of its graphitizing and ferrite-forming tendencies, and too much titanium may have the same effect on almost any iron.

The effect of titanium on the compressive strength of cast iron is approximately the same as its effect on tensile and transverse strengths. Some

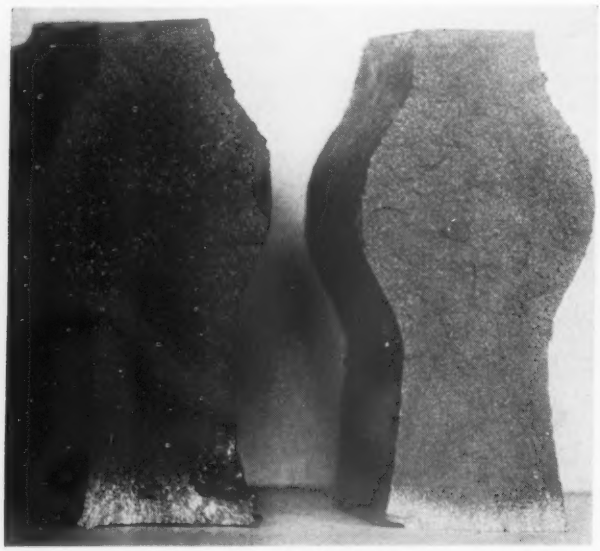


Fig. 3—Fractures of chill-tests, cupola-melted iron from same heat. Left, regular iron, 3.58% C, 2.12% Si. Right, treated in ladle with 0.2% Ti; analysis, 3.68% C, 2.36% Si and 0.172% Ti*

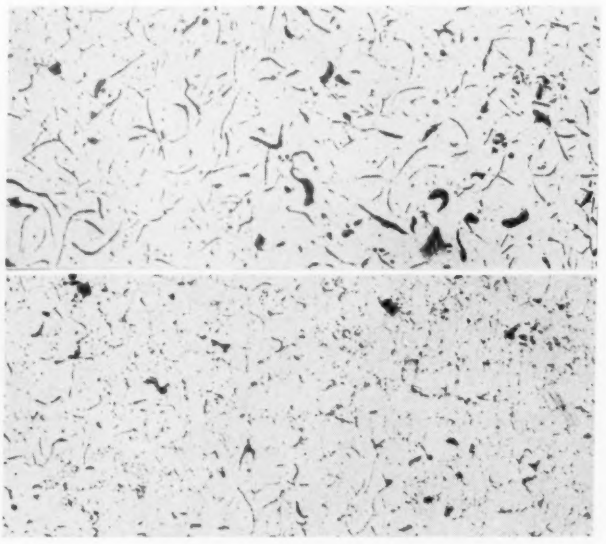


Fig. 4—Illustrating typical graphite structure of cupola-melted iron, X50. At the top, regular iron, 3.31% C, 2.33% Si. At the bottom, titanium treated, 3.35% C, 2.43% Si and 0.108% Ti*

German data on high-carbon irons with low, medium, and high silicon are given in Table III. It should be noted that the first line of the table represents a partly white, or mottled, iron, and that increasing the titanium to 0.094 per cent as in the second line weakened the iron slightly by graphitization.

In spite of the slight increase in hardness produced by titanium in gray cast iron because of the finer graphite flakes, machinability is generally improved. This probably is due chiefly to the more intimate dispersion of the fine graphite, but in may instances additional graphitization or extra ferrite in the microstructure are also responsible. The improvement in machinability by titanium has been utilized in large castings which must have very smooth machined surfaces. With coarse graphite it is very difficult to avoid surface pits in machining, and with the finer graphite in titanium iron a superior machined finish may be attained.

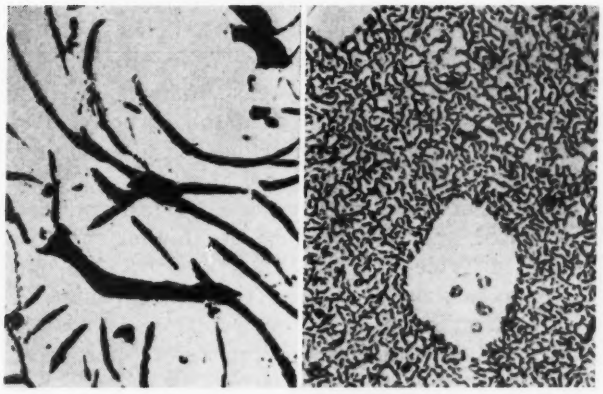


Fig. 5—Graphite in 3-in. cast iron bars, X200. Left, regular iron. Right, same iron, 0.2% titanium added, after bubbling $CO_2$ through melt[14]

The machinability of strong alloy cast iron is often not very good and can be shown to be improved when titanium is one of the alloying elements added. Data bearing on this point are presented in Table IV, where the figures reporting resistance to cutting are values of force derived from dial readings of the University of Michigan tool dynamometer, with which all these machinability tests were made under strictly comparable conditions.[18]

**Effect on Resistance to Heat, Corrosion, and Wear**—Although titanium does not decrease the scaling and growth of gray iron at high temperature as much as chromium does, it has a definitely beneficial influence in that direction. It has been reported, for instance, that, whereas a gray iron containing 3.3 per cent carbon and 2.9 per cent silicon increased 9-13 per cent in size after twenty-five 3-hr heatings at 1550° F (845° C), the same iron with 0.25 per cent titanium added showed only 6-7 per cent increase under the same conditions.[19] The reason for this effect is probably connected with the finer form of graphite produced by titanium, since a denser structure would naturally be expected to impede the penetration of the oxidizing gases which cause the growth.

**TABLE IV—Machinability of Three Alloy Cast Irons of Approximately Equivalent Strength and Hardness***

| | Cr-Ti Iron | Cr-Ni Iron | Mo Iron |
|---|---|---|---|
| **Composition** | | | |
| Ferrotitanium added, % | 1 | None | None |
| Total carbon, % | 3.43 | 3.41 | 3.39 |
| Combined carbon, % | 0.72 | 0.70 | 0.62 |
| Graphite, % | 2.71 | 2.71 | 2.77 |
| Silicon, % | 2.21 | 2.10 | 2.19 |
| Chromium, % | 0.54 | 0.62 | None |
| Nickel, % | None | 1.35 | None |
| Molybdenum, % | None | None | 0.46 |
| Titanium, % | 0.138 | 0.087 | 0.084 |
| **Properties** | | | |
| Transverse strength, lb | 5,004 | 4,789 | 5,093 |
| Tensile strength, psi | 38,700 | 38,650 | 39,000 |
| Brinell hardness | 207 | 207 | 202 |
| Comparative resistance to cutting: | | | |
| 0.00313-in. feed | 22.5 | 28.0 | 27.0 |
| 0.00694-in. feed | 37.5 | 41.0 | 39.0 |
| Drill test: | | | |
| Torque | 19.0 | 20.5 | 20.5 |
| Thrust | 880 | 900 | 900 |

*Starkweather.[18]

**TABLE V—Changes Produced in Several Cast Irons from the Same Melt by Heating 12 Times for 16 Hr at 1560°F (850°C)***

| Residual Alloy Content | Growth on 8-in. Gage Length, in. | Loss in Tensile Strength, % | Depth of Decarburization, in. |
|---|---|---|---|
| None | $\frac{5}{32}$ | 19.9 | 0.18 |
| 0.114% Ti | $\frac{5}{32}$ | 11.5 | 0.16 |
| 0.4% Mo | $\frac{3}{32}$ | 12.9 | 0.14 |
| 0.7% Cr | none | none | 0.08 |

*Titanium Alloy Mfg. Co. Unpublished research reports, 1933.

**TABLE VI—Solubility of Two Grades of High-Carbon Titanium Cast Irons in 1% Sulphuric Acid***

| 1% Silicon Iron | | 2.5% Silicon Iron | |
|---|---|---|---|
| Titanium Content, % | Weight Loss in 24 Hr, % | Titanium Content, % | Weight Loss in 24 Hr, % |
| 0 (white) | 16.2 | 0 | 15.1 |
| 0.094 | 19.1 | 0.068 | 12.5 |
| 0.327 | 14.3 | 0.118 | 12.4 |
| 0.516 | 11.0 | 0.353 | 8.7 |

*Piwowarsky.[2]

A comparison of the oxidation resistance attained with titanium and other alloying additions is given in Table V, which shows the results of various tests made before and after heating for twelve 16-hr periods at 1560° F (850° C). The irons tested were all from the same heat containing 3.17 per cent carbon and 2.24 per cent silicon; the different additions were made in the ladles. Titanium and molybdenum gave about the same decrease in deterioration as a result of the repeated heating but were not as effective as chromium, which is a strong carbide stabilizer.

Titanium generally tends to improve the resistance of gray cast iron to acid corrosion, mainly by "closing the grain" or producing a finer and denser structure. Table VI shows an example of this effect. These data refer to tests on cast iron containing 3.5-4 per cent carbon. The test specimens were 5 mm (0.2-in.) long and 15 mm in diameter and were immersed 24 hr in 1 per cent sulphuric acid.

Similar tests on lower-carbon gray-iron samples weighing about 50 grams showed practically no influence of titanium on corrosion by 2.4 per cent sulphuric acid, but in 80 per cent sulphuric acid the

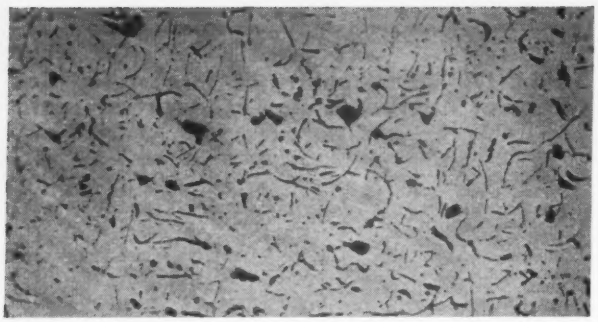


Fig. 6—Typical graphite flakes, about midway between center and edge of a cross-section of a cast bar, about 1.25 in. in diam, made of untreated iron No. 1, Table VIII. X50, unetched[29]

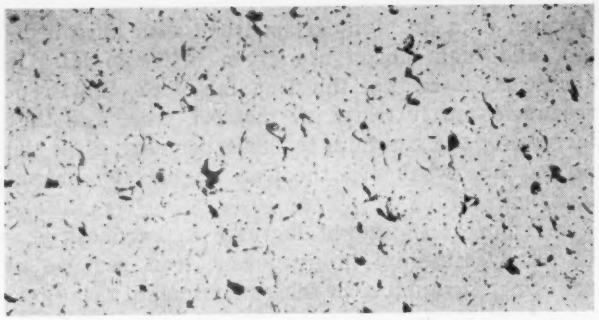


Fig. 7—Typical graphite flakes, about midway between center and edge of a cross-section of a cast bar, about 1.25 in. in diam, made of titanium iron No. 2, Table VIII. X50, unetched[29]

results given in Table VII were obtained. It may be concluded that titanium cast iron resists solution in sulphuric acid somewhat better than ordinary gray iron. In resistance to corrosion by most chemicals, however, titanium cast iron does not serve as well as other alloy irons containing larger quantities of silicon, chromium, or nickel, for instance.

Although few wear tests on cast iron have been reported in the literature and those dealing with titanium cast iron are still more scarce, a few conclusions, apparently based on reliable data, have been drawn regarding the effect of titanium on wear resistance. One publication[20] comparing molybdenum and titanium in cast iron showed that the titanium irons, with finer graphite and less tendency to chill, had a much higher resistance to wear than the others.

Within fairly recent years titanium has been found by a large automobile manufacturer to be definitely useful in alloy cast irons for gasoline-engine cylinders to reduce wear. The improvement in wear resistance, according to Jominy,[21] is due to the presence of hard titanium carbide crystals in the iron, although the hardness of the iron matrix is not increased enough to impair machinability. A patent of W. E. Jominy (U. S. Patent 2,198,775) 1940, discussed in FOUNDRY,[22] which covers this development discloses the use of copper and chromium as well as of titanium in this wear-resistant iron, the composition limits being 2.25-4 per cent C, 1.5-3.5 per cent Si, 0.3-1 per cent Mn, 0.5-1.5 per cent Cu, 0.4-2 per cent Cr, and 0.05-0.60 per cent Ti. Another similar patent of Jominy (U. S. Patent 2,225,997) 1940, covers the use of 0.6-1.25 per cent phosphorus instead of copper. These irons, with titanium in the higher part of the specified range, may be decidedly ferritic in structure and still are claimed to be very resistant to wear.

**Titanium in Alloy Cast Irons**—Titanium is used effectively for producing finer graphite in cast irons to which other alloying elements are added to improve the strength or other properties by modifying the pearlitic matrix. Molybdenum, vanadium, and chromium, for instance, strengthen gray iron chiefly by changing the structure of the pearlite, making it finer or more sorbitic, or by decreasing the amount of ferrite, but they do not produce as fine graphite flakes as titanium does. Thus, a combination of chromium and titanium is a very good one, since the graphite flakes are made fine and the chilling effect of chromium is restrained by titanium, while the tendency of titanium to produce more ferrite in the structure is overcome by chromium. A comparison of chromium-titanium iron with two other alloy cast irons is given in Table IV; all the data in this table were derived from specimens cast under identical conditions from the same base iron.

The results of a similar series of tests on electric-melted gray iron at another foundry are reported in Table VIII and illustrated by Figs. 6-9. These microstructures show the finer graphite in the titanium irons. It is evident from Table VIII that the chromium-titanium iron was the strongest. Fracture tests of thin castings of these irons showed the most chill, or white non-graphitized structure at the corners, in the chromium iron (No. 3 of Table VIII) and the least in the titanium iron (No. 2). The others all showed the same, intermediate, depth of chill.

As vanadium is a carbon stabilizer only slightly less potent than chromium, vanadium and titanium are often combined in cast iron to derive the same beneficial effects obtained from a combination of chromium and titanium. A vanadium-titanium alloy combination in gray iron, of about 0.2 per cent titanium and 0.1 per cent vanadium added, has been claimed to produce iron with fine graphite and uniform properties whether cast in ½-in. or 2-in. sections.[24, 25]

Titanium is not used with nickel in cast iron since both are graphitizers, and nickel is therefore not needed when titanium is used. In the new nodular irons, where the addition of cerium or

**TABLE VII—Effect of Titanium on the Corrosion of Cast Iron in 80% Sulphuric Acid***

| Composition, % | | | Weight Loss, G per Sq Dm, in 70 Hr |
|---|---|---|---|
| C | Si | Ti | |
| 3.49 | 1.78 | 0.042 (none added) | 0.480 |
| 3.52 | 1.78 | 0.102 | 0.432 |
| 3.46 | 2.09 | 0.051 (none added) | 0.489 |
| 3.47 | 2.23 | 0.147 | 0.418 |

*Titanium Alloy Mfg. Co. Unpublished research reports, 1933.

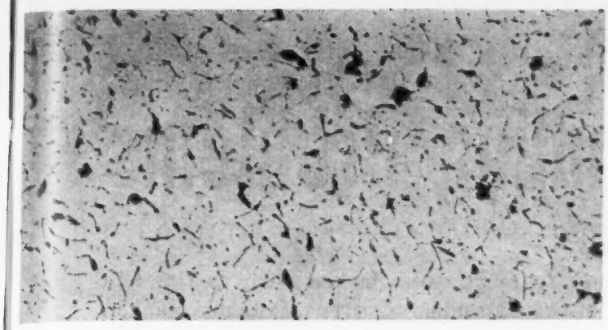


Fig. 8—Typical graphite flakes midway between the center and edge of a cross-section of a cast bar, about 1.25 in. in diameter, made of the chromium iron No. 3, in Table VIII. X50, unetched[29]

**TABLE VIII—Strength and Hardness of Various Electric-melted Alloy Cast Irons from the Same Foundry; Average Values from Five Tests***

| | Iron 1 | Iron 2 | Iron 3 | Iron 4 | Iron 5 | Iron 6 | Iron 7 |
|---|---|---|---|---|---|---|---|
| **Composition** | | | | | | | |
| Ferrotitanium added, % | None | 1 | None | 1 | 1.5 | None | None |
| Total carbon, % ..... | 3.17 | 3.18 | 3.18 | 3.16 | 3.18 | 3.17 | 3.16 |
| Combined carbon, % .. | 0.68 | 0.64 | 0.83 | 0.82 | 0.84 | 0.81 | 0.69 |
| Graphite, % ..... | 2.49 | 2.54 | 2.35 | 2.34 | 2.34 | 2.36 | 2.47 |
| Silicon, % ..... | 2.24 | 2.26 | 2.23 | 2.25 | 2.24 | 2.24 | 2.24 |
| Chromium, % ..... | Trace | ... | 0.72 | 0.74 | 0.73 | 0.75 | ... |
| Nickel, % ..... | ... | ... | ... | ... | ... | 1.27 | ... |
| Molybdenum, % ..... | ... | ... | ... | ... | ... | ... | 0.42 |
| Titanium, % ..... | 0.042 | 0.114 | ... | 0.126 | 0.138 | ... | ... |
| **Properties** | | | | | | | |
| Transverse strength, lb | 4,400 | 4,512 | 4,390 | 4,930 | 4,625 | 4,672 | 4,362 |
| Increase over untreated, % ..... | | 2.5 | | 12.0 | 5.1 | 6.2 | |
| Deflection, in. (12-in. span) ..... | 0.125 | 0.134 | 0.107 | 0.112 | 0.110 | 0.106 | 0.115 |
| Tensile strength, psi .. | 38,800 | 39,900 | 43,000 | 46,700 | 46,000 | 42,900 | 44,300 |
| Increase over untreated, % ..... | | 2.7 | 10.8 | 20.2 | 18.4 | 10.5 | 14.0 |
| Brinell hardness at center ..... | 192 | 196 | 217 | 223 | 217 | 217 | 217 |
| Midway between center and edge... | 196 | 207 | 223 | 235 | 235 | 223 | 228 |

*Comstock.[23]

magnesium causes the graphite to occur as spherical particles instead of flakes, titanium has not been found to be especially useful. In fact, it has been reported to interfere with the nodulizing effect[26, 27, 28]

**Summary** — Titanium, like other deoxidizers, tends to promote graphitization in cast iron, about 0.1-0.15 per cent being equivalent in this respect to 0.7 per cent silicon. It also produces fine titanium carbide crystals in molten iron before it solidifies, and these promote fine grain size by a nucleating effect.

In gray iron, titanium gives finer graphite flakes than other alloying additions do; it increases the strength of high-carbon irons, but low-carbon irons may be weakened by titanium because of the graphitizing effect.

In general, machinability and resistance to heat, corrosion, and wear are all slightly improved by titanium in cast iron.

In alloy cast irons, titanium is useful in producing fine graphite, and in combination with chromium or vanadium the effect on strength is especially favorable. Titanium is not used at present in the new nodular irons.

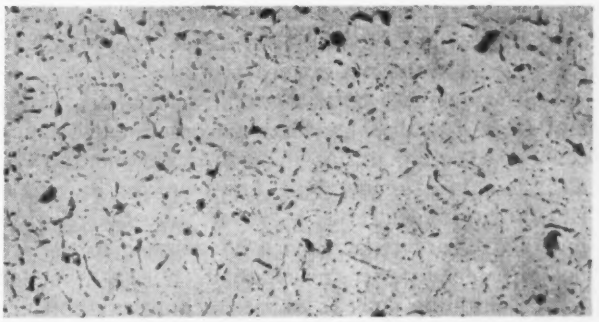


Fig. 9—Typical graphite flakes, midway between center and edge of cross-section of a bar about 1.25 in. in diam cast of chromium-titanium iron No. 4 (1% FeTi), Table VIII. X50, unetched[29]

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# *Application of Fork Trucks to* Foundry Handling Problems

ALTHOUGH fork-lift trucks have been used in some foundries for many years, they probably will be seen a lot more often in foundries as managements concentrate on reducing costs and increasing efficiency of in-plant materials handling. This segment of the manufacturing process offers the greatest potential for economy, and in most cases the mechanization of present manual handling methods will result in the largest savings.

Some foundries may try fork trucks for the first time. Others will add to an existent fleet. Typical of this latter group is Dalton Foundries Inc., Warsaw, Ind., which has built up a fleet of five Clark fork trucks in the last six years.

Dalton operates both a gray iron foundry and a malleable foundry and has assigned each truck certain handling duties in each department. The assignments are not rigid, however, for a certain flexibility is desirable to meet unusual requirements. A fork truck normally assigned to the annealing department, for example, might be called to the shipping dock to assist during peak periods.

Dalton's fork trucks are used at the malleable furnace, in the annealing department, in the cleaning and grinding departments and on the shipping dock. Use of a truck equipped with a dump-type tote box to load the malleable air furnace with scrap and pig iron has considerably reduced the cost of this daily operation. Formerly a chain hoist was used to lift wheelbarrows to the top of the furnace and dump their contents. Ten or twelve men were required to man the wheelbarrows, usually for a whole eight-hour shift. Now one man and a fork truck do the job, dumping 55 tons of scrap into the furnace in a few hours. When not used for this purpose, the truck helps out in the shipping department.

In the annealing department a fork truck is used exclusively to move pots packed with castings in and out of the six annealing ovens. Pots are stacked four or five high for handling by the fork truck, each stack weighing around 5000 lb. About 175 pots are handled each eight-hour shift. The truck is not affected by the sudden temperature changes it encounters while moving in and out of the ovens, even though temperatures in the rear of the ovens often reach 400° F.

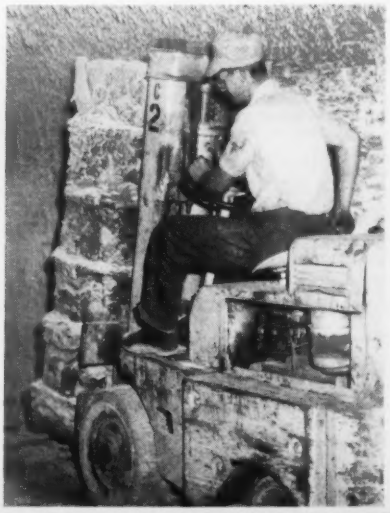
The truck carries pots from the packing station directly into the ovens and later removes them to a shakeout at the left of the packing station. There the castings are separated from the gravel and moved by monorail buckets to the cleaning room. Gravel is returned to a hopper over the packing station. The fork truck then returns empty pots to the packing station. The fork truck also is used to open and close oven doors.

Probably the most obvious advantages of fork truck handling at Dalton are evident in the gray iron foundry, where two fork trucks are responsible for maintaining a smooth flow of castings through

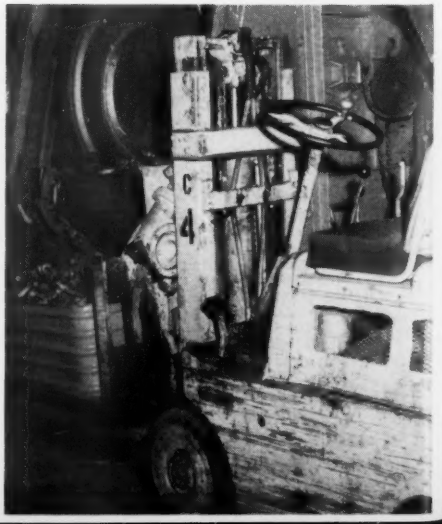
Boxes are carried from shot blasting machines to metal rack for temporary storage. Fork trucks permit use of a rack four tiers high, conserving floor space

Malleable air furnace metal is charged by truck with dump box

Truck moves pots of castings in and out of six annealing ovens



Two trucks move gray iron castings through cleaning department



the cleaning and grinding processes. In this department castings are handled in large metal tote boxes which have channels welded to their bottoms to provide for fork insertion.

The process begins when a fork truck deposits a box under the mouth of a shot-blast machine to receive a load of cleaned castings. From there the box is carried to a nearby rack and stored until the grinding section is ready for it.

This metal rack is an important aid in the smooth handling of castings. Situated approximately half-way between the shot-blasting machines and the grinding tables, it serves as a convenient place for in-process storage of tote boxes. The rack was made in four levels so that the fork trucks could be used to tier the boxes, thereby conserving space. It has a capacity of 96 boxes.

From the rack, boxes are removed to the grinding and inspection bins. The trucks which do this job are equipped with forks which can revolve a full 360 degrees. The box is carried to the rear of a grinding bin, elevated above the working surface and turned so that the castings fall into the bin. The empty box is lowered and set on a short roller under the table. After grinding and inspection, the castings are replaced in the box and transported by the same truck to the shipping department.

First stop at the shipping dock is the scales, where the castings are weighed. Then the rotating device again is called into play as the castings are dumped on the floor for sorting, tagging and loading aboard trailers. Loading usually is manual, although occasionally a bin is carried directly aboard a trailer by a fork truck.

Plant Engineer Robert Clarke estimates that 50 tons of castings go through the grinding and inspection departments every day. Since the castings are handled several times, this amounts to about a 200-tons-per-day average for the two trucks.

Servicing and maintenance of the fork truck fleet is performed by Dalton's own mechanics. At present a preventive maintenance program is being set up to assure that the trucks receive proper care at regular intervals.

Dalton's utilization of fork trucks has been very effective. In several cases substitution of mechanical handling for manual methods has resulted in considerable savings in time, man-hours and money, and in all cases the fork trucks have increased the efficiency of handling procedures and brought about a smoother flow of materials between manufacturing stages. As further study of the plant's handling operation uncovers new opportunities for improved methods, additional fork trucks will be purchased to augment the existing fleet.

*Left,* rotating forks dump castings in inspection and grinding bins. *Below,* trucks transport castings to shipping department

After weighing on shipping department scales, castings are dumped out and are loaded manually

When castings are shipped or stored in wooden crates, truck handling again conserves space

# QUESTIONS

**Providing color appeal to aluminum castings . . . . .**

**Metal quality gage . . . . . Chilled car wheels**

**Making pipe fittings . . . . . Permanent molding**

## Coloring Aluminum Castings

**QUESTION** We understand that some research has been made on coloring the metal of aluminum sand castings. Can you supply any information?

**ANSWER** So far as we know the coloring of aluminum and its alloys is applied only to the surface. It is accomplished by anodizing or developing a porous oxide coating which then is impregnated with a dye or pigment to supply the desired color. Color is sealed in the oxide coating by immersing in boiling water, in dichromate solution, sodium silicate, etc.

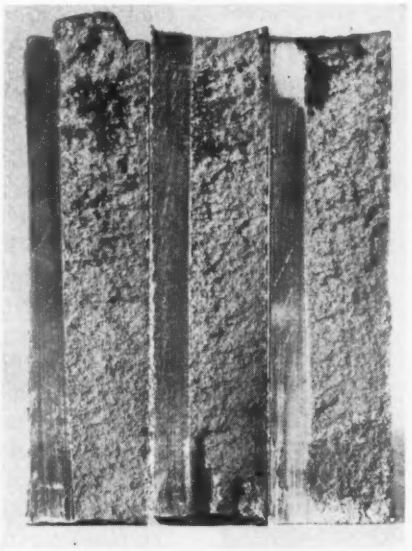
Possibly you may mean the more recent development of applying vitreous or porcelain enamel to the surface of aluminum similar to the process used on ferrous materials. Due to the lower melting point of aluminum the frit or glass used has a considerably lower fusing point than does that used on iron or steel. In practice the aluminum is cleaned carefully, sprayed with the frit solution and dried. Then the coated aluminum is placed in a furnace at a sufficiently high temperature to fuse the frit into a continuous coating.

## Fracture Test Gages Quality

**QUESTION** We are sending you three fracture test specimens made of the 85-5-5-5 alloy according to the design suggested by the Brass and Bronze Division of the American Foundrymen's Society—that is, a ¾ x 3 x 6-in. bar with one of the ¾ x 6-in. faces cast against a chill. Will you examine these, which are marked A, B, and C, and tell us the quality of the heats involved?

**ANSWER** We grade the bars in the descending order of A, B, and C. However, we are handicapped somewhat in giving a definite opinion on whether the first of the series or bar A is high or intermediate quality. Specimens sent to us were sawed in such a manner that we had to refracture approximately under one of the gates, and due to the short allowance for gripping in a vise, a deep saw cut was necessary—not to mention that it was a tough job.

Presence of the brown patches at the top of two of the pieces, and lack of columnar structure at the chilled faces, indicate that the pouring temperature was low. The discolored areas in specimens B and C seem to indicate that they were quenched at too high a temperature. It might be pointed out that to obtain concordant results with any test it is necessary that it be conducted under the same conditions each time.



Fracture bars A, B and C respectively

In this case the temperature should be determined pyrometrically so that the metal is poured at a definite temperature and the specimens are quenched at a definite time interval after pouring. We are sure that with a little care and practice with this fracture test you soon will be able to gage with reasonable accuracy the quality of the melt before pouring.

## Information on Chilled Wheels

**QUESTION** Can you give us any information on the following relative to chilled cast iron carwheels: Proper pouring temperature, time in the mold before shakeout, and the maximum time between shakeout and placing in the annealing pits?

**ANSWER** According to available information on manufacture of chilled iron car wheels, the least variation in chill depth and over-all shrinkage is obtained when the iron is melted at 2650° F and poured at 2425°. While no definite data are available on how long the wheel remains in the mold before shakeout, we suspect that it occurs as soon as the sprue freezes over since mention is made that on shakeout the hub shows about 1900°, the plate or web 1550°, and the tread 1200° F.

Investigation has indicated that the best results in annealing are obtained when the wheels are placed in the pit at an over-all average temperature of 1550° or about that on shakeout. Also it has been determined that temperature drop after shakeout is 2.5 to 3° per minute, and if the wheels are placed in the pits from 2 to 7 minutes after shakeout, good results are obtained. Wheels usually remain in the pits about 72 hours.

## Wants to Make Pipe Fittings

**QUESTION** In our foundry in Colombia we are going to start production of cast iron pipe fittings from 2 to 6 in. in diam for pressure work, and would appreciate information on the method of manufacture. We use synthetic molding sand mixtures controlled by our laboratory, using bentonites, native clays, seacoal, wood flour and cereal according to our needs. Molds for the fittings will be made in steel flasks, using jolt-strip molding machines. Patterns will be aluminum mounted on wood boards. We are thinking of using oil-sand cores since they are the type we are familiar with. We would like to have information on position of runners, sprues and gates for the various fittings; type of chaplets for supporting the cores, etc. Is it possible to use green sand cores; how are they made, and what sand mixture? Is the mold poured in the green state or skin dried? Should the mold be coated or uncoated?

**ANSWER** Pipe fittings can be made by hand or on machines, and usual practice is to use green sand cores. In machine molding cores are made separately in split coreboxes (halves) which are "booked" to form the full core. Cast iron arbors are placed in the drag section of the core. These are formed with a backbone along which several semicircular disks or wings are located. The disks extend to about ½-in. from the outer surface of the core. Venting of the cores is accomplished with rods laid along the backbone, and pulled out when the core is completed. In the case of elbows the rods must be set angular-

ly—meeting or crossing at the center.

Where the cores do not have suitable bearings or support and would tend to twist or turn, such as in an elbow, one end of the arbor is extended at a right angle to form a "wing." A cavity of suitable shape is formed in the drag mold to accommodate the wing. In case of tees and crosses the arbors are arranged so that they can be separated at the center point to permit removal from the casting, and be used again.

Gating usually is into the ends of the castings, using flat gates. You will have to experiment on gate size, but you might try ¼ x ¾-in. as a start. In making cores the procedure is to place a layer of sand in the bottom of the drag or lower half and then put in the arbor. Remaining sand is put in place and rammed. Possibly all the sand could be placed in the box, the arbor pushed into it, then some sand added and rammed. Upper half box is rammed. Joint surfaces of the boxes are struck off and the two boxes brought together at the inner edges. Outer edges are lifted up vertically with the center of rotation along the inner edges until the faces of the two boxes meet. In other words, the operation is like closing a large book. Boxes are then laid down or rolled so that the drag or lower half is on the bench. Top half of the box is removed, core taken out and placed in the mold, and then another core is made. Chaplets never are used since they might result in leaks—and are not necessary since the arbors supply sufficient support to prevent sagging or raising.

Sand used for molds and cores is the same. It should be reasonably permeable—say from 80 to 100—and have a green compression strength from 7 to 9 psi. Grain size may vary considerable, as is indicated by one foundry using a sand with 60 AFS fineness while another employs sand of 90 fineness. Moisture is around 5 to 6 per cent.

Possibly you might be interested in a method developed by Thomas Boyde which was described in the December, 1946 issue of FOUNDRY. In it two matchplates are made with the patterns forming shells. Those are set on the flasks with the under or hollow side up and filled with sand, the arbor being placed in the drag section. Sand is squeezed on both and then the two halves with the flasks are booked, rolling so that the cope is at the top. Then the cope flask is filled with sand and squeezed. The whole is rolled over, the drag flask filled with sand and squeezed.

Next the drag mold is removed and set aside. Drag matchplate is removed, the drag mold replaced, and the whole rolled over. Then the cope mold is removed, followed by the cope matchplate. Cope mold then is replaced and the mold is ready to be poured. The author points out that with these matchplates and molding procedure, the core is not touched, and claims that it worked quite successfully with operators having no previous molding experience.

## When Is a Casting Defective?

**QUESTION** We are sending you a piece of a casting which was returned to us by one of our customers. This particular piece is part of a propeller blade made of Ni-Hard. This was shipped as a repair part and when received the box was in excellent shape, but the casting was broken. Customer claims the casting is defective and consequently should have replacement free of charge. Foundry which poured the casting has examined the piece, feels that the casting was not defective, and consequently is not liable. We discussed this with our foundry foreman and it was his opinion that some type of yardstick has been set up to take care of such instances, perhaps based on the relative amount of area between the defective part and the sound casting.

**ANSWER** After examining the section of the casting submitted for inspection, it is our opinion that it is defective due to the presence of the blowholes. We believe the understanding between consumer and producer of castings—even though not spelled out—is that the castings shall be sound, that is free from injurious defects. To us the blowholes, even though near the edge of the blade, are indicative of unsoundness.

Holes appear near edge of the casting

Whether or not the blowholes led to the fracturing or breaking of the casting is difficult to ascertain, but it is a possibility. The heavy coating of paint on the surface prevents worthwhile examination of the piece, but we would expect that a reasonably careful examination of the casting in the cleaned state should have given some evidence of possible defect since the blowing was from the surface inward, and some of the holes are practically at the surface.

Your reference to a yardstick as to degree of defect possibly might be established in some instances between consumer and producer, but we do not believe with respect to blowholes, shrinks or porosity, to mention but a few. For example, we recall one where a small pressure-resisting casting was considered acceptable if it did not leak more than 1 cc during 24 hours. Design of the casting was such that it practically was impossible to produce a leakproof product, so it was impregnated and then tested for leakage.

## Fumes Carried Into Foundry

**QUESTION** A few years ago you supplied us with information relative to cupolas, and now we are looking for information on ventilation. Our problem concerns fumes from our nonferrous furnaces, which are the open type, and more particularly when scrap lead is being melted to pour ingots. We have installed an 8 x 4 tapered canopy with a 12-in. funnel which we thought should provide sufficient exhaust. But apparently a certain amount of baffle has been created by the heat of the furnace giving a back draft. This causes the lead fumes to disperse all over the foundry space. Can you suggest a satisfactory solution without undergoing a major change?

**ANSWER** Solution of your problem requires considerably more information than is supplied in your inquiry. For example, data needed would include height of the canopy above the floor, whether open on all sides or partially enclosed, height of the stack or chimney, temperature reached in the stack, etc. Those would be used to determine available pressure for gravity venting, volume of air or gas to be vented, and diameter of the outlet stack or chimney.

However, we suspect that your trouble lies in two possibilities. One is that the outlet stack is not large enough, and the other is that it is not high enough above the surrounding structures. The latter is

indicated by your remark that a backdraft is present which dumps the fumes into the foundry. That condition usually results from downdrafts created by wind currents striking or sweeping over higher structures and descending on the other side.

Therefore, we suggest you first try extending the present stack so that it is appreciably above any structures in the immediate vicinity. That will eliminate the backdraft and take away some of the fumes. Other steps that can be taken include reducing the volume of air and gases to be exhausted by enclosing the sides of the canopy or by arranging the canopy so that it can be raised and lowered. Either move will reduce the amount of air drawn in from the surrounding building or foundry, and permit the stack primarily to exhaust gases from the furnace.

If these changes do not aid in removing the fumes satisfactorily, then you will have to increase the diameter of the outlet stack or attach an exhaust fan to it. Possibly injection of compressed air into the stack (vertically) would provide greater draft, but it is an expensive way to do it.

## Permanent Mold Information

**QUESTION** We have been operating a foundry for over 70 years and recently discontinued its operation since our tonnage has gone to pressed steel. We now are considering the manufacture of malleable and gray iron castings on a permanent mold basis. Can you give us any information as to what is required as to molds, etc., in the use of the permanent mold process, especially when applied to aluminum castings? Any information on material used, etc., will be appreciated.

**ANSWER** Your recent inquiry relative to permanent molds is not quite clear to us since you refer to malleable iron, gray iron and aluminum. So far as we know, the process is not applied to any great extent to malleable iron while a few production foundries make a large number of small gray iron castings. Greatest use is in making aluminum alloy castings.

Molds usually are gray iron, and design is a most important feature. Basically permanent molding follows the same principles for sand—that of obtaining directional or progressive solidification whereby those casting sections farthest from the gate freeze or solidify first, and the freezing action moves gradually to the gate, which is last to freeze. To do this, thickness of the mold sections may be varied, portions may be heated or cooled by various means, etc. Heating may be by direct application or through insulation; cooling may be accomplished by increasing surface radiation through use of exterior ribs, fins or studs, or by air blast.

Rule of thumb for determining mold thickness is about 3 or 4 times casting section, but that is difficult to attain. To obtain the necessary rigidity the walls should be not less than about ¾-in., and in the case of heavy sections the mold might become unwieldy. Gates are arranged so that the metal enters the mold with the least turbulence. Heavy casting sections usually are located on the parting or joint line of the mold so that they can be risered, and molds must be vented along the parting line with thin scratch vents where required.

Mold faces usually are coated with some type of refractory to prevent sticking of the casting, and ejection pins are provided to ease the casting from the cavity. Simple lightweight molds may be opened and closed by simple lever systems or pneumatically, but as the weight increases rack and pinion systems have to be applied.

You can see by the foregoing that the design of permanent molds depends largely on skill and experience, and most firms engaged in this field either have their own designer or have their molds made by others engaged commercially in mold manufacture.

## Graphite Effect on Fluidity

**QUESTION** Please advise us how graphite increases the fluidity of gray cast iron, and also suppliers of that material.

**ANSWER** Graphite may be used in different ways to increase fluidity or flowability of cast iron. For example, in the August, 1953 issue of FOUNDRY an article on "What the Fluidity Test Reveals About Gray Cast Iron" by Porter and Rosenthal states that maximum fluidity of the iron was found at a carbon equivalent of 4.56. Hence, any addition of carbon to an iron which is below that value will increase its fluidity.

During the war when coke was critical and of poor quality, graphite in various forms was added in the cupola with good results to increase carbon content. One manufacturer indicates that about 4 lb of graphite per ton added to iron at the spout gives a spiral fluidity test of 44 in. compared with 33 in. without the addition. It also has been reported by a foundry using a graphitic additive in the sand that the fluidity is greater than when the material is not used. Presumably the material acts somewhat like seacoal, reducing the friction between sand and metal.

Graphite in various forms is available from various firms whose names and addresses may be found in the advertising section.

## Has Shrinks in Heavy Section

**QUESTION** We are casting jacketed cylinder heads with an iron containing 3.14 per cent TC, 1.70 per cent Si, 0.64 Mn, and under 0.10 per cent S. The average wall thickness is ½ to ⅝-in. However, there is an area where the metal is 1¼ in. thick and at this spot we have leakage when the casting is tested at 60 psi pressure. We are using 20 per cent structural steel in our mixture. Can you recommend any change in our analysis to prevent the leakage?

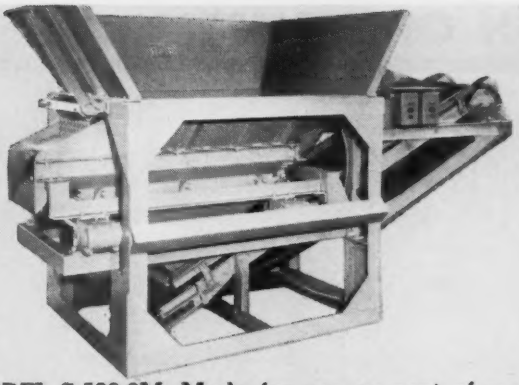
**ANSWER** While changing the composition to provide a fine dense structure as opposed to an open coarse one often is beneficial, it usually operates only where uniform section thicknesses prevail. In your case we suspect the trouble is due to the heavy section being fed through the lighter ones, which freeze off or solidify long before solidification is completed in the former, leaving shrinkage areas.

Remedy of course is to change the gating so that metal is fed into the heavy section until solidification is completed. If that cannot be accomplished readily, you will have to resort to some method of chilling whereby the heavy section solidifies at the same rate as the adjoining lighter sections. One procedure used with considerable success is to coat the core in the desired area with a paste containing a small amount of tellurium. That element is a strong carbide stabilizer and care should be taken to see that its action is confined to specific areas.

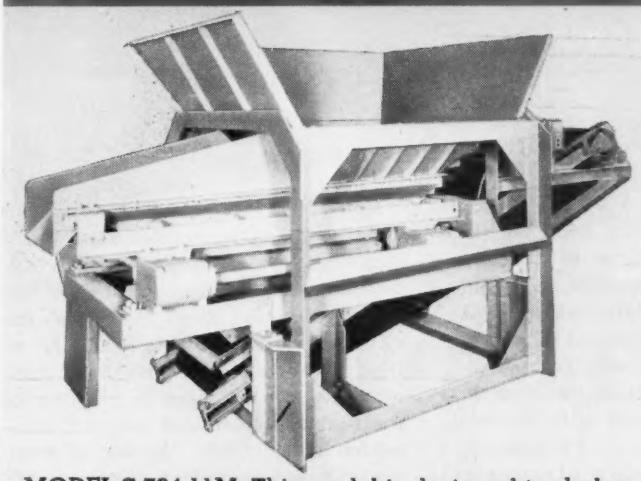
Possibly you might be able to obtain some air by use of zircon sand at the affected area where the heavy section is located. Higher density of zircon sand gives it a considerably higher capacity for chilling than that of silica sand.

If the leakage is not too bad, you might be able to secure some relief by reduction of the silicon content in the iron and addition of sufficient nickel to eliminate any tendency toward hard areas in the lighter section. For example, you might try reducing the silicon to 1.35 to 1.50 per cent and adding 1.0 to 0.60 per cent nickel.

# "mechanization" YOU can afford!



MODEL S-522-9M. Made for use as part of a centralized sand system. The large open-sided hopper directs the complete charge from a front end loader onto a Royer Shake-Out where the large scrap is riddled out. Magnetic separation removes the fine scrap; sand is discharged into a Royer Sand Separator and Blender or the skip hoist to a muller.



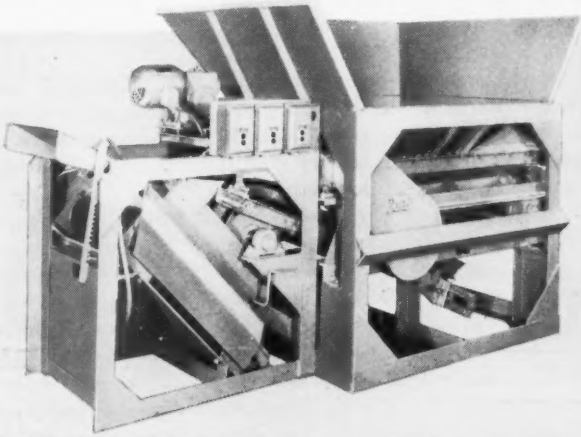
MODEL S-724-11M. This model is designed to shake-out castings and clean sand in one operation. Sand and castings scooped from the molding floor are charged into the hopper and onto a Royer Shake-Out. Castings are discharged at one end at proper height for feeding a table or conveyor where they can be sprued and sorted. Completely cleaned sand is discharged at the opposite end.

The new series of Royer "Scrap Control", with its versatility of application, can supply a varied amount of mechanized casting removal, sand cleaning and conditioning. Here is a unit that puts "mechanization" within the reach of all . . . supplying the benefits of labor saving and production line operation at lowest possible cost.

Take this opportunity to cut down the high cost of hand labor in your sand conditioning operations. Verified results show up to 50% of a night crew released for other work, with the damage by tramp iron to pattern equipment eliminated and scrap losses reduced 75%. We will be glad to study your operation and recommend the proper equipment . . . no obligation, of course.

## CHECK THESE FEATURES

1. **Up to 60 tons of clean sand per hour.**
2. **No pits . . . no excavating.**
3. **Low receiving hopper.**
4. **High sand and scrap discharge.**
5. **Rugged Shake-Out utilized as a riddle.**
6. **No screens to clog.**
7. **Easily made portable.**
8. **Readily relocated.**
9. **Four-sided 5 ton capacity hopper available for all units.**



MODEL S-522-5MR. Here is a complete packaged sand cleaning and conditioning unit. Fed by front end loader, the sand is cleaned by a Royer Shake-Out and magnetic separator, tempered and given final preparation by a Royer Sand Separator and Blender. Unit can be moved by overhead crane, setting up the conditioning operation where desired.

*Foremost in Sand* ROYER *Conditioning Equipment*

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# MEN OF INDUSTRY

ROY L. SALTER
*. . . Brake Shoe executive*

STEPHEN D. MOXLEY
*. . . becomes ACIPCO pres.*

WALTER SOKOLOSKY
*. . . joins Remington Rand*

ROBERT A. WILLEY
*. . . joins Steel Founders*

**ROY L. SALTER,** since 1946 vice president of operations, Southern Wheel Division, American Brake Shoe Co., New York, was recently appointed first vice president of the division. A graduate of Alabama Polytechnic Institute, he joined the company in 1924.

♦ ♦ ♦

**Stephen D. Moxley** has been named president, American Cast Iron Pipe Co., Birmingham, succeeding **Charles O. Hodges,** who has retired after 38 years with the company. **Arnold Herrmann** was re-elected vice president-sales manager. **Frank H. Coupland** was named vice president-works manager, **Kenneth R. Daniel,** vice president-chief engineer, and **A. E. Bowen,** treasurer. Mr. Moxley joined the company in 1923 and advanced through positions in the engineering department to chief engineer and vice president-engineering. He became vice president in 1946 and executive vice president in 1953.

♦ ♦ ♦

**C. W. Ammen** has organized Ammen Nonferrous Corp., 5245 Randolph St., Los Angeles 22, and is president of the company. He recently acquired the foundry assets of Universal Brass Mfg. Co., there, which he joined last year as superintendent. Mr. Ammen was previously foundry superintendent, California Brass Mfg. Co., Los Angeles, and is the author of FOUNDRY'S "Trouble Shooting" department.

♦ ♦ ♦

**William H. Shinn,** assistant sales manager, was recently appointed sales manager, Foundry Division, Gunite Foundries Corp., Rockford, Ill. **Harold Small** continues as sales manager of the Automotive Division.

**Walter Sokolosky** recently joined Remington Rand Inc., Ilion, N. Y., where he is in charge of the aluminum and iron foundries. A graduate of Norwich University, he attended the graduate school of Massachusetts Institute of Technology. Mr. Sokolosky entered the foundry industry as a chemist with Warren Pipe & Foundry Corp., Phillipsburg, N. J., and after holding positions as metallurgist and superintendent in various foundries, he later was engaged as a sales engineer for foundry products.

♦ ♦ ♦

**William C. Cheek** has been named assistant superintendent of process engineering, Danville plant, Central Foundry Division, General Motors Corp., Danville, Ill. **Robert C. Robinson,** formerly methods engineering supervisor, has succeeded Mr. Cheek as superintendent of standards and methods. **Charles E. Fausel,** until recently assistant maintenance superintendent has been appointed to a superintendency, responsible for a special assignment. Mr. Cheek, a graduate of Purdue University, joined the Danville plant in 1952. Mr. Robinson was graduated from University of Illinois, and has been at Central Foundry since 1952. Mr. Fausel joined the Danville plant in 1951, following graduation from University of Illinois.

♦ ♦ ♦

**Robert H. O'Brien,** formerly associated with Ford Motor Co.'s foundry department, Chicago, was appointed representative in Illinois and Michigan, Chemical Division, Borden Co., New York, with headquarters at the chemical plant in Union, Ill.

**Robert A. Willey,** formerly chief metallurgist, Commercial Steel Casting Co., Marion, O., has been appointed assistant technical and research director, Steel Founders' Society of America. A graduate of Ohio Wesleyan and Ohio State universities, he has been a member of the society's technical research committee since 1950. Active in engineering and technical societies, Mr. Willey has presented talks before steel foundry groups, and is the author of many papers on steel founding.

♦ ♦ ♦

**Philip F. Thayer,** for the last 6 years general manager, Willamette Iron & Steel Co., Portland, Oreg., has been appointed vice president, General Metals Corp., San Francisco, and general manager of its Metals Division which operates foundries in Oakland, Calif., Los Angeles and Houston, Tex.

♦ ♦ ♦

**Cecil N. King** has been named manager of the Winfield Plant, Dodge Division of Chrysler Corp., Detroit. Mr. King was graduated from Alabama Polytechnical Institute and the Chrysler Institute. He has been engaged in the automotive foundry products field for 3 years.

♦ ♦ ♦

**Gerrel E. O'Quin** has been appointed vice president in charge of research, Charlotte Pipe & Foundry Co., Charlotte, N. C. He was formerly with the Cast Iron Soil Pipe Institute, Washington.

♦ ♦ ♦

**Aaron E. Hess** has been elected executive vice president-general manager, Lancaster Malleable Castings

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A check of its important features shows you why this advanced conveyor is increasing production, cutting costs and maintenance in many foundries. Let Jeffrey foundry engineers show you the advantages of this more versatile, better-integrated system to transport molds.

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ALOYSIUS M. TULLO
. . . *Worthington division mgr.*

VINCENT GERBEREUX
. . . *division mgr., Worthington*

B. J. OTIS
. . . *foundry design engineer*

DAVID STEIN
. . . *G. H. R. Foundry engineer*

Co., Lancaster, Pa. **Richard G. Hess** has succeeded him as vice president-sales manager.

♦ ♦ ♦

**Aloysius M. Tullo** has been appointed general manager of the Harrison Division, and **Vincent Gerbereux,** general manager of the Standard Pumps Division, recently established by Worthington Corp., at Harrison, N. J. Mr. Tullo was manager of Worthington's Wellsville, N. Y., works from 1951 until last year when he became manager of the Harrison works. **Clarence K. Hood,** a company vice president, is sales manager of the Harrison Division, **George F. Habach,** executive engineer, **Thomas F. Quinlan,** comptroller, and **Charles Schwalje,** foundry manager. **Max A. Heyman** was named Harrison works manager. Mr. Gerbereux, had been manager of the Centrifugal Pump Division since 1951.

♦ ♦ ♦

**Nicholas Kowall,** formerly superintendent of the steel foundry cleaning division, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., has been appointed superintendent of the company's steel division. A graduate of University of Alabama, Mr. Kowall spent 3 years as a research metallurgist, Naval Research Laboratory, Washington, prior to joining the company in 1946.

♦ ♦ ♦

**B. J. Otis,** formerly plant engineer, Central Specialty Division, King Seeley Corp., Ypsilanti, Mich., has joined Samborn, Steketee & Associates, consulting engineers, Toledo, O., where he will be in charge of foundry design.

♦ ♦ ♦

**J. E. McMillin** has been appointed sales manager, Wayne Aluminum Foundry & Machine Co., Garden City, Mich. He joined the company's sales staff 2 years ago, following 15 years in purchasing and operating capacities in the gray iron and nonferrous foundry industry.

♦ ♦ ♦

**Carl F. Leitten** has been elected executive vice president, Electro Refractories & Abrasives Corp., Buffalo. After joining the company in 1926 as a laboratory assistant he attended night courses at University of Buffalo for 4 years. He became superintendent of the refractory department, general superintendent, plant manager, vice president-manufacturing in 1943 and a director in 1945. Mr. Leitten is also vice president, Electro Refractories & Abrasives of Canada Ltd., and has been its managing director since 1949.

♦ ♦ ♦

**David Stein,** who recently received his degree in mechanical engineering at Purdue University, has been appointed engineer at G. H. R. Foundry Division, Dayton Malleable Iron Co., Dayton, O.

♦ ♦ ♦

**Vernon C. Robinson,** formerly field engineer, Norma-Hoffman Bearings Corp., Stamford, Conn., recently joined the Development and Research Division, International Nickel Co., New York, as a member of the Twin Cities Technical Field Section, in Minneapolis. Mr. Robinson was graduated from University of Minnesota. Previously he was associat-

NICHOLAS KOWALL
. . . *steel division supt.*

CARL F. LEITTEN
. . . *refractories executive*

J. E. McMILLIN
. . . *sales mgr., Wayne Aluminum*

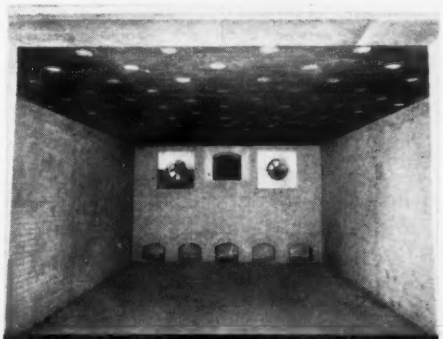
VERNON C. ROBINSON
. . . *development-research, INCO*

# IMPROVED annealing cycles

*through*

## A. P. GREEN *Engineered*

## REFRACTORY LININGS



Oil-fired annealing oven for malleable castings. The flat suspended arch is KAST-O-LITE and the sidewalls are G-23 Insulating Firebrick.

Malleable operators report easier controlled annealing cycles through the use of the proper combination of A. P. Green refractories. Efficient furnace operation means lower production costs and better control of the physical properties of the castings. It can only be achieved by a refractory enclosure which contributes to the desired annealing cycle.

A. P. Green KAST-O-LITE insulating refractory castable was used throughout sidewalls and arch for this pulverized coal-fired oven.

The two ovens illustrated are typical examples of A. P. Green engineered refractory linings. One is a complete monolithic lining of A. P. Green KAST-O-LITE, a light weight castable refractory. The other is a combination lining—KAST-O-LITE arch and G-23 Insulating Firebrick sidewalls. Both have excellent performance records effecting improved product quality at reduced fuel costs.

The A. P. Green Fire Brick Company Engineering Department will assist you with further information on the application of these materials to new units or the conversion of existing furnaces. Call your local A. P. Green distributor . . . he's listed in the yellow pages of your telephone directory . . . or write . . .

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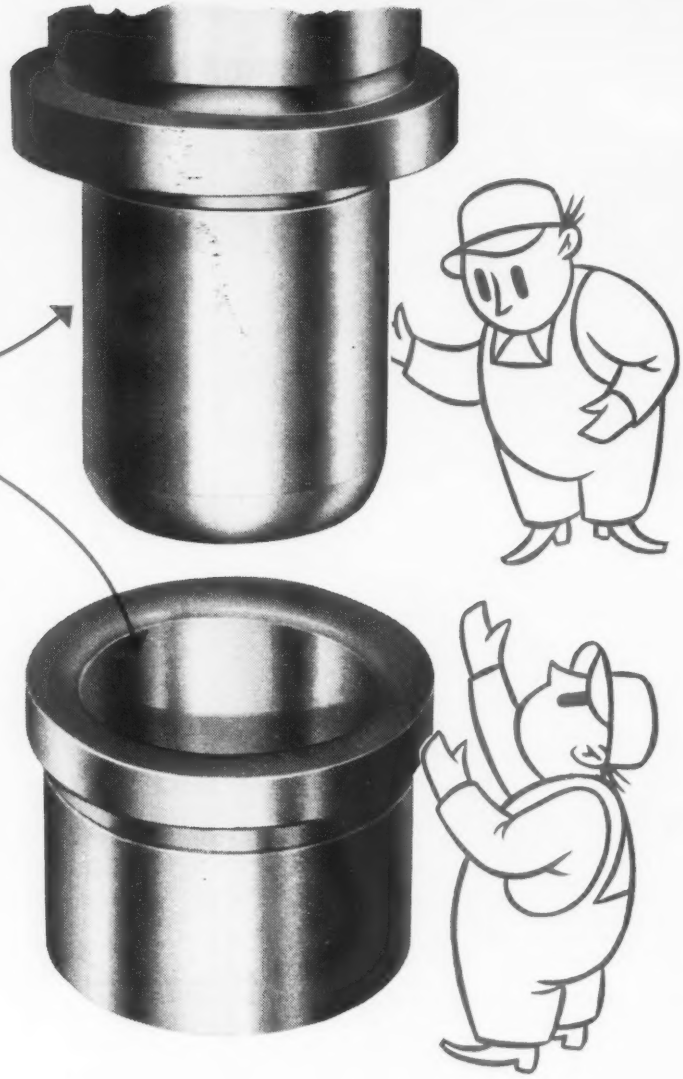
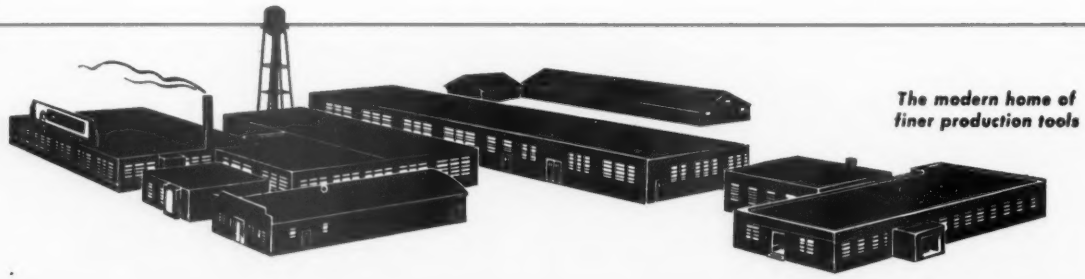
# carburized and hardened steel wearing surfaces and ductile cores mean long life for UNIVERSAL flask pins and bushings



It's no easy trick to produce flask pins and bushings that are hard enough to take long, rigorous wear, and yet have cores ductile enough to resist breakage and rough treatment in the foundry. However, Universal has accomplished this difficult task. Universal flask bushings are double quenched and double drawn to produce a fine grain structure that will withstand considerable stress and strain without breaking or chipping. The wearing surfaces are carburized and hardened to reduce wear and prolong the life of both pin and bushing. Universal flask pins and bushings are precision ground to extremely close tolerances to insure instant, accurate alignment of cope and drag. Plain, taper and threaded series pins and bushings are available in a complete range of sizes as regular stock items. For complete information about Universal flask pins and bushings, write to the office nearest you — Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis. — or the home office.



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ALFRED A. HILBRON
*. . . hotel convention sales*

ROY C. HOBSON
*. . . Chicago plant mgr.*

ALLAN S. BIXBY
*. . . Melrose Park plant mgr.*

ed with Saginaw Malleable Iron Division, GMC, Saginaw, Mich., Carnegie Illinois Steel Corp., Chicago and Gary, Ind., and United States Steel Supply Co., St. Paul.

♦ ♦ ♦

**Warner B. Bishop Jr.,** sales manager of the Foundry Products Division, Archer-Daniels-Midland Co., Cleveland, has been elected an assistant vice president of the company. A graduate of Dartmouth College, he joined the company in 1945 and served as the division's export manager and assistant sales manager, becoming sales manager in 1949. **John H. Daniels,** sales manager for linseed oil in St. Paul, and **Burton W. Schroeder,** manager of the Industrial Cereals Division in Minneapolis, were also named assistant vice presidents. **William O. Foelker,** Minneapolis, was elected assistant secretary.

♦ ♦ ♦

**George E. Schultz** was appointed general foreman of the pattern shop and brass foundry, Norwood, O., works, Allis-Chalmers Mfg. Co., Milwaukee. Mr. Schultz was graduated from Massachusetts Institute of Technology and since 1952 was a metallurgist at the development laboratory in Norwood.

♦ ♦ ♦

**Frederick Farnow,** formerly manager of the San Francisco plant, Federated Metals Division, American Smelting & Refining Co., New York, has been named Pacific coast manager for the division, succeeding **Leo Halpern,** who has resigned.

♦ ♦ ♦

**Thomas A. Ratkowski** has been named manager for engineering and development, American Manganese Steel Division, American Brake Shoe Co., New York. He will be located at division headquarters in Chicago Heights, Ill.

**Alfred A. Hilbron** has been appointed assistant director of convention sales, Morrison Hotel, Chicago. For the past 7½ years Mr. Hilbron was convention and exhibits manager, American Foundrymen's Society, Chicago. Prior to joining the AFS as an executive staff member he was assistant manager of conventions and sales, Hotel Sherman, Chicago.

♦ ♦ ♦

**Leslie B. Bellamy** was recently named general manager of operations, Sterling Grinding Wheel Co., Tiffin, O. Other appointments include: **Kenneth E. Lautzenhiser,** assistant treasurer-office manager; **Gilman F. Farley,** works manager; **L. V. Dippell,** manager of research-development; **Harold E. Erf,** manager of sales administration; **O. J. Lautermilch,** manager of sales engineering. **John R. Gregor** has been made manager of research-development organic, Peninsular Grinding Wheel Division, and **Frank O. Klapp,** advertising and public relations manager for Peninsular and Sterling. The companies are subsidiaries of Abrasive & Metal Products Co., Detroit.

♦ ♦ ♦

**Dr. R. J. Sarjant,** formerly acting director, has been appointed director, British Steel Castings Research Association, Sheffield, England. **Dr. A. H. Sully,** until recently head of the metallurgy division, Fulmer Research Institute, has been named associate director of research.

♦ ♦ ♦

**Louis G. Helmick Jr.,** for the past year manager of manufacturing, Joy Mfg. Co., Pittsburgh, has been elected vice president-manufacturing. A graduate of Cornell University, he joined the company in 1947 and previously served in the Franklin, Pa., and Claremont, N. H., plants.

**Roy C. Hobson,** since 1953 assistant manager, has been named manager of the Chicago plant, National Malleable & Steel Castings Co. A graduate of University of Maine, he has spent more than 25 years with the company, working in railway road service, inspection, engineering and sales. Before joining the Chicago plant he was assistant to the vice president-sales, in the company's general offices, Cleveland. **Allan S. Bixby** has been appointed manager of National Malleable's Melrose Park plant, Chicago. He was graduated from Rose Polytechnic Institute and joined the company in 1921. He transferred to the Chicago plant in 1926 where he became plant engineer and finishing superintendent. In 1939 he went to the Melrose Park plant as general superintendent and was assistant manager there.

♦ ♦ ♦

**William A. Damerel** has been appointed a vice president, and **Dr. Fred Schulman,** assistant director of research, Mercast Corp., New York. Mr. Damerel was formerly works manager, American Bosch Corp., Springfield. Mr. Schulman until recently was technical director, Herrick L. Johnston Inc., Columbus, O., and is still one of its directors. **A. F. Anzlovar** has been named vice president of Mercast Mfg. Corp., La Verne, Calif., subsidiary of the New York company.

♦ ♦ ♦

**Willard M. Mobley,** formerly chief chemist and research director, Alabama By-Products Corp., Birmingham, was recently appointed technical director, heading the company's new Technical Control and Research Department.

♦ ♦ ♦

**Frank B. Powers** was elected vice president-sales manager, Burnside Steel Foundry Co., Chicago. He will

## MEN OF INDUSTRY

WILLIAM W. LAMB
*. . . joins Precision Metalsmiths*

THOMAS C. MORTIMER
*. . . Delta regional sales mgr.*

SAMUEL W. BROWN
*. . . woodworking products mgr.*

A. DONALD MOLL
*. . . joins Minneapolis Electric*

continue as secretary-treasurer. **James L. Jackson** was named assistant sales manager, and **Joseph E. Egan,** assistant to the president.

♦ ♦ ♦

**William W. Lamb** recently joined Precision Metalsmiths Inc., Cleveland, as sales manager, succeeding **R. W. Devans,** who, as vice president-treasurer, has assumed other duties. Mr. Lamb attended Fenn College and Case Institute of Technology. Previous associations include production engineering, Aluminum Co. of America, Pittsburgh; sales engineering, Wellman Bronze & Aluminum Co., Cleveland, and vice president - general manager, Ohio Magnesium Castings Co., Cleveland, which he helped organize.

♦ ♦ ♦

**David E. Neustadt** recently joined W. W. Sly Mfg. Co., Cleveland, as general sales manager. Mr. Neustadt attended Ohio State University and was West coast district manager in Los Angeles for American Wheelabrator & Equipment Corp., Mishawaka, Ind., until 1952 when he became vice president-general sales manager, Chas. Rivitz & Co., Cleveland.

♦ ♦ ♦

**Thomas C. Mortimer** has been named southern regional sales manager with headquarters in Atlanta for Delta Power Tool Division, Rockwell Mfg. Co., Pittsburgh. He joined the company in 1948 as Boston district sales manager. **Samuel W. Brown,** for the past year assistant to the vice president, has succeeded Mr. Mortimer as woodworking products manager for the division. Previously he was assistant to the vice president-engineering for 5 years.

♦ ♦ ♦

**Donald E. Webster,** for the past 25 years chemist and metallurgist, American Laundry Machinery Co., Rochester, N. Y., was recently appointed foundry superintendent there. Following graduation from Rochester Institute of Technology in 1923, he was associated with Whitehead Bros. Co. in its Rochester laboratory. Active in the Rochester Chapter of the AFS, he is now its vice chairman.

**A. Donald Moll** has been appointed sales engineer, Minneapolis Electric Steel Castings Co., Minneapolis. A graduate of Massachusetts Institute of Technology, Mr. Moll was previously associated with American Manganese Steel Division, American Brake Shoe Co., and Union Carbide & Carbon Co., New York, and Lake Erie Engineering Corp., Buffalo.

♦ ♦ ♦

**R. A. Buchholz,** formerly in the Cleveland district sales office, Harbison-Walker Refractories Co., Pittsburgh, has been named manager of district sales in Pittsburgh. A graduate of Alfred University, he was assistant manager of the Cape May, N. J., plant, Northwest Magnesite Co., a Harbison-Walker subsidiary, until 1945 when he was transferred to the parent company's sales staff.

♦ ♦ ♦

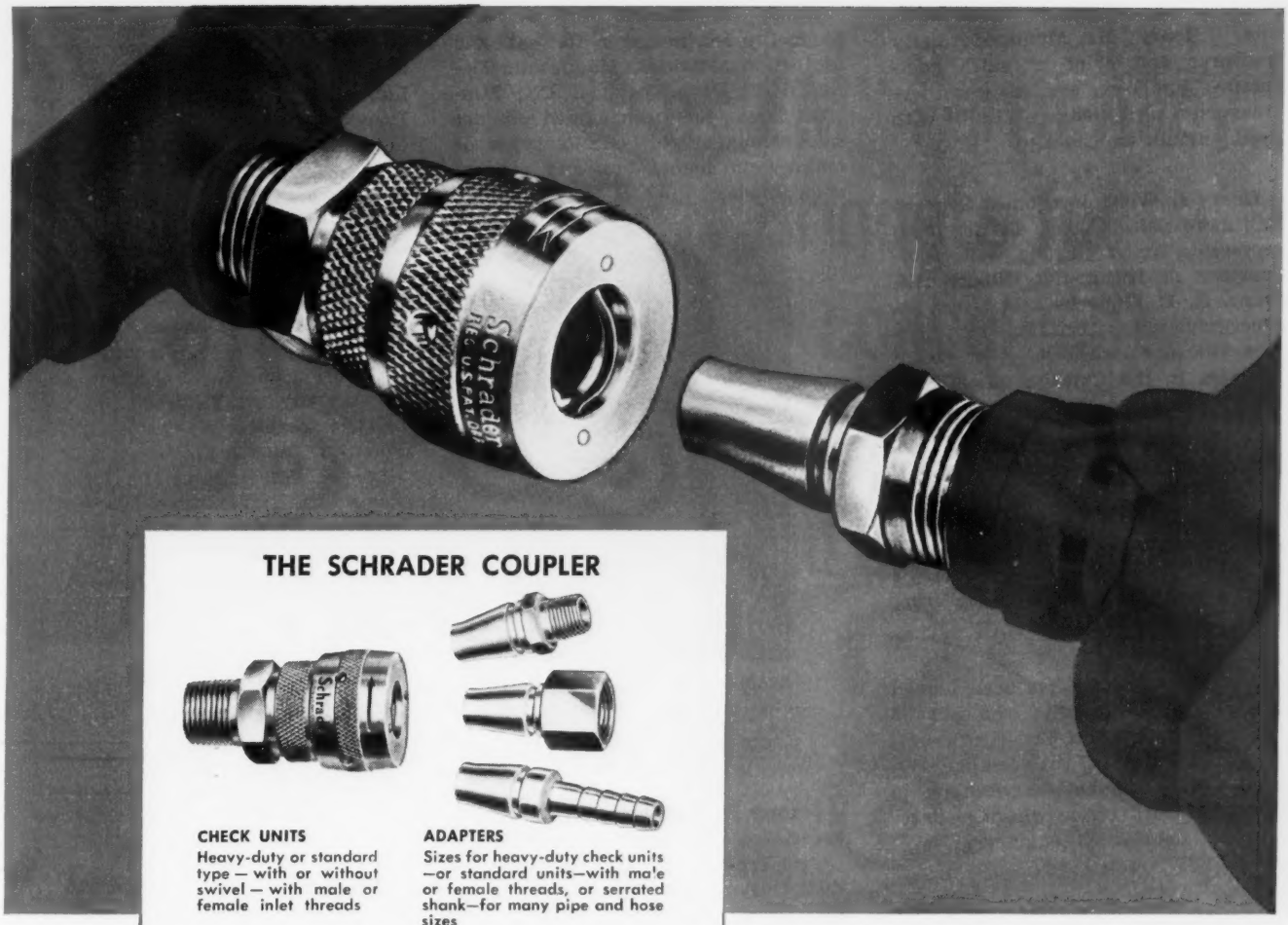
**Arthur T. Dalton,** until recently secretary-sales manager, Chicago Wheel & Mfg. Co., Chicago, has been named vice president-sales. He has been associated with the company for 30 years and is a past di-

DAVID E. NEUSTADT
*. . . joins W. W. Sly Mfg. Co.*

DONALD E. WEBSTER
*. . . becomes foundry supt.*

R. A. BUCHHOLZ
*. . . Harbison-Walker district mgr.*

ARTHUR T. DALTON
*. . . Chicago Wheel v.p.*

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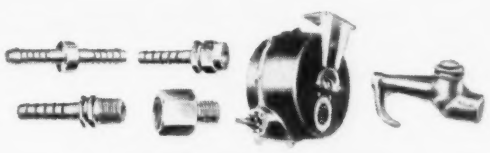

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rector of the Grinding Wheel Institute. **Henry M. Mann,** formerly treasurer and chief of sales engineering, has been elected secretary-treasurer of Chicago Wheel, with headquarters in Chicago.

♦ ♦ ♦

**Henry L. Wolfe** has joined Syntron Baltimore Sales Co. as district sales representative in Virginia, with headquarters in Richmond. **Gilbert Hilbrant, R. B. Dietsche** and **Henry A. Fleer** have joined the sales staff, Syntron Chicago Sales Co., with headquarters in the Chicago office.

♦ ♦ ♦

**A. J. Ball,** formerly Detroit sales engineer, Hewitt-Robins Inc., Stamford, Conn., has been appointed Cleveland district manager, succeeding **P. A. Burns,** who has been named manager of sales at the company's conveyor machinery manufacturing plant in Passaic, N. J.

♦ ♦ ♦

**Alden H. Webber** has been named field sales engineer in the Seattle area, for the Bristol Co., Waterbury, Conn. He joined the company in 1943 as instrument serviceman in the New York office where he later became field sales engineer.

♦ ♦ ♦

**L. O. Geiger,** since 1927 manager of the Dayton, O., district, Air Reduction Sales Co., New York, has retired after 38 years with the company. **C. R. Grange,** assistant district manager, has succeeded Mr. Geiger. With the company since 1934, Mr. Grange previously was assistant sales manager in the St. Louis district.

♦ ♦ ♦

**Norman T. Bauer** was recently appointed service engineer in the Chicago area, Acheson Colloids Co., Port Huron. Mich. Mr. Bauer attended Illinois Institute of Technology and Northwestern University.

♦ ♦ ♦

**G. C. Mitchell,** for 7 years divisional purchasing agent, Chrysler Corp., Detroit, was recently appointed staff executive of the company's central purchasing department.

♦ ♦ ♦

**Wilbur Nixon** recently resigned from Federated Metals Division, American Smelting & Refining Co., New York, where he was engaged in purchase of nonferrous material and sale of brass and bronze ingot.

♦ ♦ ♦

**Joseph P. Bradshaw** has been named western district sales manager, Industrial Truck Division, Clark Equipment Co., Battle Creek, Mich., with headquarters in San Francisco.

**Hilary A. Humble,** for 5 years product sales manager for cathodic protection activities, Magnesium Department, Dow Chemical Co., Midland, Mich., has been named product sales manager for various types of magnesium ingot, flux and magnesium anodes.

BRADFORD W. ALCORN, elected vice president, Tousey Varnish Co., Chicago, and continuing as sales manager, as reported in March.

**Jerome B. Wollaston,** until recently associated with Ajax Electrothermic Corp., Trenton, N. J., has joined Inductotherm Corp., Glenolden, Pa., as director of sales and service.

♦ ♦ ♦

**Harold Wheeler** recently was appointed personnel director, Allyne-Ryan Foundry Co., Cleveland. For

10 years Mr. Wheeler had held a similar position with Superior Foundry Inc., there.

♦ ♦ ♦

**John B. Dempsey** has been appointed manager of electric tool sales, Thor Power Tool Co., at company headquarters in Aurora, Ill. A graduate of Bucknell University, he joined Thor in 1938. **Otto Shellenberger,** since 1951 a service engineer in the Detroit office, has succeeded Mr. Dempsey there as branch manager.

**Richard Doughton** has been appointed development engineer, Product Development Division, Jones & Laughlin Steel Corp., Pittsburgh. Mr. Doughton was in the company's sales department in 1941, when he was appointed analyst, War Production Board, Washington. During World War II he was in the Forging and Castings Section, Bureau of Ships, and engineer officer on a Navy cruiser. He was associated with Electro Alloys Division, American Brake Shoe Co., Philadelphia and Pittsburgh, and General Electric Co., Schenectady, N. Y., from 1946 until recalled to active Navy duty in 1949. Following duty in the Office of Naval Materiel, Washington, Mr. Doughton was returned to inactive duty in 1951, when he became staff metallurgist, Materials Advisory Board, National Academy of Sciences, Washington.

♦ ♦ ♦

**George M. Roberts,** formerly vice president-general manager, American Machinery & Supply Co., Atlanta, has been named district sales manager in Charlotte, N. C., for the Delta Power Tool Division, Rockwell Mfg. Co., Pittsburgh, with headquarters at his residence, 366 Hillside Ave., in Charlotte.

♦ ♦ ♦

**T. S. Roderick** has been elected vice president-sales, Alcaloy Inc., Cleveland, and Trenton, N. J. Mr. Roderick was graduated from the U. S. Naval Academy and after 8 years of Navy duty was discharged in 1949. For the past 5 years he was general manager, Barnes Permanent Mold Inc., Mansfield, O.

♦ ♦ ♦

**Sam D. Groff,** advertising manager, Mexico Refractories Co., Mexico, Mo., received a Distinguished Service Award recently from the Mexico Chamber of Commerce in appreciation of his outstanding achievements as president of the Great Rivers Council of the Boy Scouts of America.

♦ ♦ ♦

**William T. Ingram** has been appointed general sales manager, Reynolds Metals Co., to supervise activities of the company's six sales regions. He has been transferred to sales headquarters in Louisville, from Los Angeles where he was sales manager of the Pacific coast region.

♦ ♦ ♦

**Frank Turnbull** recently joined Sipi Metals Corp., Chicago, to handle the company's line of alloys, with headquarters in the Detroit office.

♦ ♦ ♦

**Joseph L. Heckler** has been appointed sales representative in northern Ohio and northwestern Pennsylvania, Stoller Chemical Co., Akron, O.

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# Foundrymen and Educators Meet in FEF CONFERENCE

MORE than 150 foundrymen and educators met in Cleveland, Mar. 9-10, for the annual College-Industry Conference of the Foundry Educational Foundation. The meeting provided an opportunity for a discussion of teaching programs at the 14 FEF schools and for an exchange of ideas between industry members and college faculty on training methods and requirements.

The conference program also included the annual meeting of the foundation and election of officers and trustees. Officers chosen by the trustees for the coming year include: President, E. C. Hoenicke, Eaton Mfg. Co., Vassar, Mich.; vice president, J. H. Smith, Central Foundry Division, General Motors Corp., Saginaw, Mich.; secretary-treasurer, E. M. Knapp, Ferro Machine & Foundry Inc., Cleveland; executive director, E. J. Walsh.

Newly elected trustees are: W. G. Ferrell, Auto Specialties Mfg. Co., St. Joseph, Mich.; H. A. Forsberg, Continental Foundry & Machine Co., East Chicago, Ind.; E. R. Oeschger, General Electric Co., Schenectady, N. Y.; Earl Taltenghi, H. C. Macaulay Foundry Co., Berkeley, Calif.; L. P. Robinson, Archer - Daniels - Midland Co., Cleveland.

Trustees named to represent the various founding members of FEF include: American Foundrymen's Society, L. H. Durdin, Dixie Bronze Co., Birmingham; Gray Iron Founders' Society, R. R. Washburn, Plainville Casting Co., Plainville, Conn.; Foundry Equipment Manufacturers Association, K. F. Lange, Link-Belt Co., Chicago; Malleable Founders' Society, T. T. Lloyd, Albion Malleable Iron Co., Albion, Mich.; Non-Ferrous Founders' Society, H. A. White, Smeeth-Harwood Co., Chicago; Steel Founders' Society of America, R. P. Brewer, Symington-Gould Corp., Depew, N. Y.

FEF President Thomas Kaveny Jr., Herman Pneumatic Machine Co., Pittsburgh, presided at the conference's opening session and welcomed those in attendance. In the keynote address, "Molding Your Future," James H. Smith, Central Foundry Division, GMC, declared that at no time has the future of the castings industry had as much promise as it does today. He added that for the industry to capitalize on its technological developments will require not only advancement in engineering and research and continued investment in plants and equipment, but, more importantly, a continued flow of management potential with new ideas and abilities. Foundation schools are an important source of this future management, he stated.

Mr. Smith urged the schools to promote in students the right attitude toward work and people. One study, he said, showed that 90 per cent of the men who fail on their jobs do so because of the wrong attitudes in these respects; only 10 per cent fail through lack of technical knowledge or manual skill.

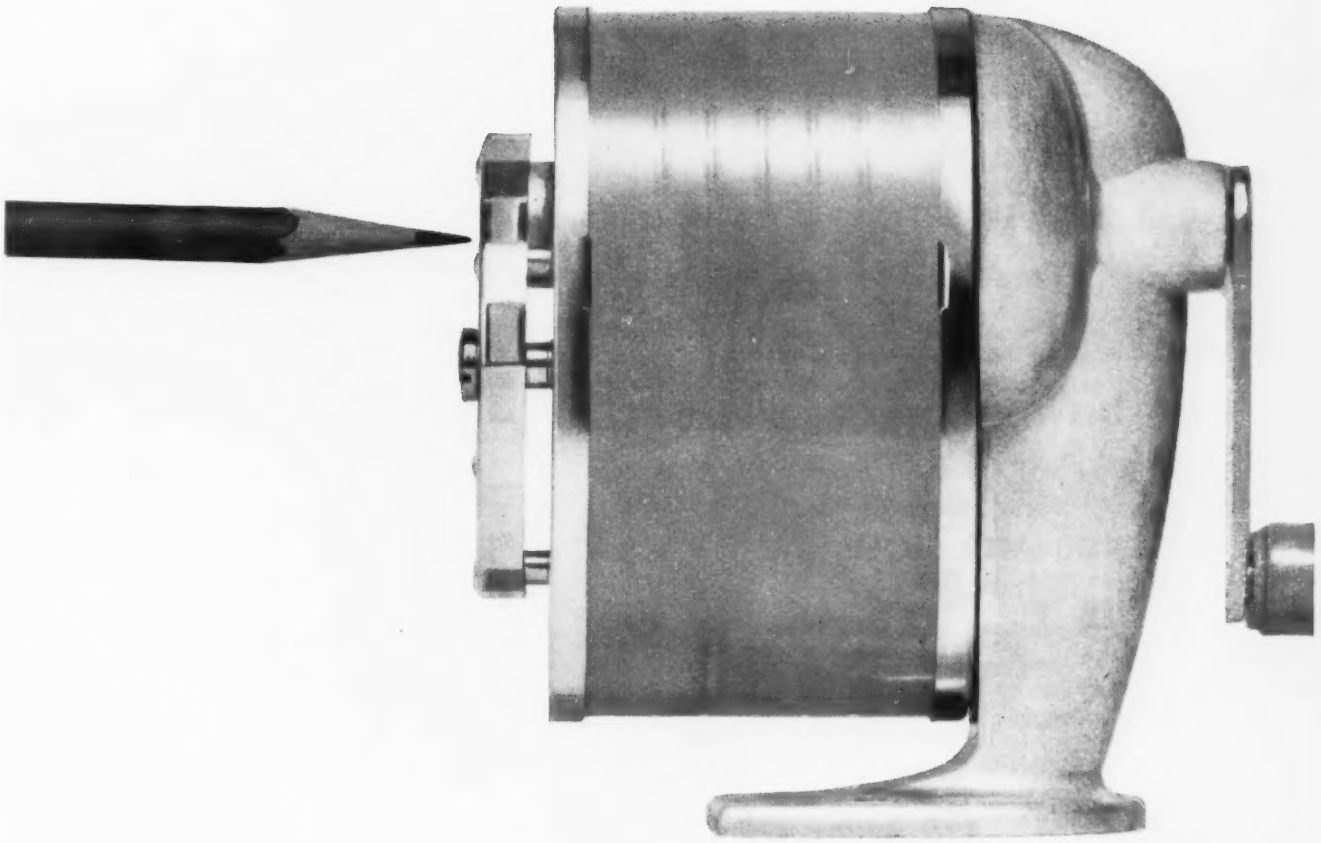
**University Activity**—Representatives of seven of the FEF schools discussed various phases of their foundry training work. H. A. Montgomery, Purdue University, described the course that school gives to all engineering students to acquaint them with the casting process. It employs industry films and classroom and laboratory demonstrations to explain foundry operations and casting applications to some 2500 students each year.

Dr. A. J. Smith, Michigan State College, discussed his school's curricula in metallurgical and mechanical engineering. Pointing out that the foundry engineer is concerned with the mechanical problems of foundry operation and the foundry metallurgist with metal, he noted that a foundry option has been adopted in both the mechanical engineering and the metallurgical dedepartments.

Dr. D. C. Williams, Ohio State University, described four areas in which foundry students at OSU are trained. These include process control, time study, methods evaluation and statistical analysis. He also showed how students participate in the laying out of foundries which are actually being built.

C. M. Adams, assistant professor, Massachusetts Institute of Technology, explained the role of research as a tool in foundry education. Benefits from both sponsored and contract research include: New information used in classwork; material for undergraduate and graduate theses; experience for the individuals involved; contact with industry; summer work for undergraduates; economical acquisition of equipment; maintenance of a pro-

Annual banquet held during the recent College-Industry Conference of the Foundry Educational Foundation



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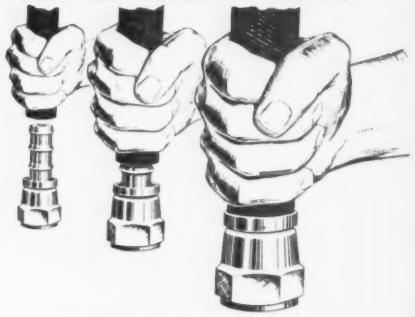

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fessional staff for the foundry program, and data for the industry's use.

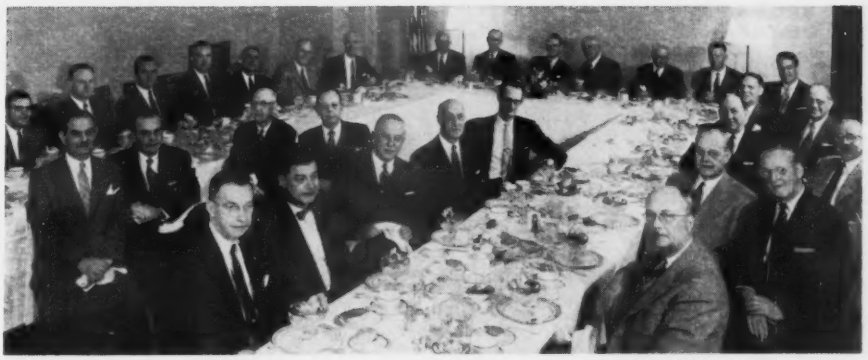
Dr. L. F. Mondolfo, Illinois Institute of Technology, presented an analysis of the duties of 15-20 graduates of the FEF program and 50-60 other individuals with engineering degrees who are in the foundry industry. He discovered that most are in foundries with over 100 employees and that their positions range from management, research, development and sales to personnel. He noted that there seemed to be no difference in use of men with foundry options and those who had had research, management or other types of opitions.

J. F. Wallace, associate professor, Case Institute of Technology, spoke generally of the future direction of foundry education at Case. He stated that training should be fundamental, devoted to teaching the bases of engineering. Foundry mechanics, he said, are not really a part of college education. Such training is the province of trade schools and technical high schools. Foundry work is changing from an art to a science, and the application of today's science is not so valuable as basic knowledge and the ability to think problems through clearly.

D. C. Ekey, assistant professor, Pennsylvania State University, discussed statistical inference as a basic subject at Penn State. Noting that statistical techniques (not to be confused with the ordinary type of statistics) have expanded successfully in recent years, he said that theoretical statistics can apply to any body of data on which a decision is required. Statistical inference methods are tools which help when results are reasonably used and considered. They help practical men to make decisions and cannot be ignored with competitive success. All Penn State students are required early to take basic statistics for later use.

**Committee Reports**—Speaking for the Technical Advisory Committee to the FEF, James H. Lansing, Malleable Founders' Society, offered that group's assistance to both the schools and to their individual advisory committees in various matters connected with the foundry courses, laboratory work and special meetings.

Prof. H. F. Tavlor, MIT, University Advisory Committee chairman, pointed to the failures of foundries to seek graduating engineers sufficiently early in the year. Visits to the campus after March often are too late. He also said some foundries do not understand how best to utilize those they hire permanently or for summer work. Know what you want and what you will do with the man before you hire him, he advised.



Present and past officers and trustees meet during FEF conference

B. E. Gavin, National Malleable & Steel Castings Co., Indianapolis, representing the Industry Advisory Committee chairmen, said that activities of the committees at the FEF schools in working with the students are helped when an AFS chapter also exists. Regional meetings of the committee chairmen are being considered.

**Sales and Markets**—With M. J. Allen, American Steel Foundries, acting as moderator, a six-man panel discussed the role that engineers can play in foundry sales departments. Members of the panel were T. T. Lloyd, Albion Malleable Iron Co.; R. L. Gilmore, Superior Steel & Malleable Castings Co.; C. H. Ker, Dalton Foundries Inc.; R. B. Parker, American Brake Shoe Co., and S. C. Wasson, National Malleable & Steel Castings Co.

The panel generally was in agreement that 1) a technical background offers a number of advantages to the casting seller, 2) it is desirable for the sales engineer to have imagination and be of the competitive type as well as be able to talk the engineering language, 3) it is not too important what type of engineering degree the salesman possesses, 4) graduates are not fully aware of the possibilities in sales engineering work, 5) the characteristics that make a good salesman are not too different from those that make a good supervisor, 6) the prospective sales engineer should receive a comprehensive indoctrination program in the plant, 7) it is most important that the sales engineer understand the design requirements of castings.

Speaking on "Properly Engineered Castings, W. C. Ferrell, Auto Specialties Mfg. Co., termed as obsolete the practice of merely adding more metal to a part that has failed. The part should be redesigned, he said. Castings will be found best suited for many applications now filled by competitive products if they are properly designed and made of the right metal—and the customer will save money. He added that there are more limitations to foundrymen than there are to castings.

Two of the most interesting talks given at the conference were by former FEF scholarship holders. A. W. Bardeen, Case '51, now with Ohio Brass Co., and R. H. Dobbins, Michigan State '51, of Albion Malleable Iron Co., commented on their experiences in preparing for and entering the foundry industry.

E. C. Hoenicke, Eaton Mfg. Co., president-elect of FEF, said that the foundry industry has not fully recognized the importance of the foundation's objectives, partly because in some cases the function of an engineer is not understood. He praised the work of the 14 co-operating schools and indicated that the addition to this group of schools on the West coast and in the South and Southwest is being planned.

In summing up the conference, Prof. E. R. Shorey, University of Wisconsin, pointed out that those suggesting additions to the present curriculum of an engineering school should realize that if this were done the already full schedules would mean that some courses would have to be dropped.

The annual banquet Thursday evening was presided over by M. J. Allen, American Steel Foundries, with Dr. Keith Glennan, president, Case Institute of Technology, the principal speaker. Citing a few of the many technological developments of recent years, Dr. Glennan said that a better understanding of the basic sciences would be required of the future engineer. He referred to industry's important stake in education and said that financial support should be considered not as charity but as an investment to assure a continuation of industrial progress.

# INDUSTRY BRIEFS

**COMBUSTION Engineering-Superheater Inc.,** 1032 West Main St., Chattanooga, Tenn., is building a mechanized foundry for the production of cast iron soil pipe by the centrifugal process. Estimated to cost over $2 million, the foundry building will be a windowless structure with a floor space of between 60,000 and 90,000 sq ft. Ventilation will be scientifically controlled by a mechanical system. The new foundry is expected to be completed in 15 to 18 months.

**Electronicast Inc.,** formerly located at 1731 West Fulton St., Chicago, has been purchased by P. J. Nilsen, owner, Nilsen Mfg. Co., Addison, Ill., and the facilities moved to the latter location. Mr. Nilsen has assumed the presidency of Electronicast and Mel F. Burr, formerly president, has become sales manager. Electronicast was organized in 1948 and will continue to produce precision investment castings.

**Federal Foundry Supply Co.,** Cleveland, has formed a new division for production and sales of the company's line of San-Blo core and mold blowing machines and allied foundry equipment. To be known as the San-Blo Division, it will be headed by George E. Miller, sales manager, and will have sales offices in New York, Chicago, Detroit, Milwaukee and Los Angeles.

**McCarthy Bros. Construction Co.,** 4903 Delmar Blvd., St. Louis, has been awarded a federal contract to rehabilitate the government-owned foundry adjacent to the Scullin Steel Co.'s plant at 6691 Manchester Ave., St. Louis. Scullin used the foundry to produce tank parts during World War II.

**Shell Patterns Inc.,** Plymouth, Wis., has been formed to make shell molding patterns. Authorized capital stock is 500 shares of common of no par value. Registered agent of the firm is Herb DeTroye, East Mill St., Plymouth, Wis.

**Trojan Nonferrous Foundry Co.,** Troy, O., started brass, bronze and aluminum foundry operations in March. Proprietor of the foundry is Thomas E. Martin.

**American MonoRail Co.,** 13107 Athens Ave., Cleveland 7, has appointed four new distributors. Newell Equipment Co., P. O. Box 3264, Birmingham, headed by C. P. Newell, is the new distributor for Alabama. The eastern Iowa and Moline, Ill. area has been assigned to the Ken-Dick Corp., 1712-Fifteenth St. Place, Moline, Ill., headed by K. A. Draves. Northern Indiana is represented by the Miller Steel & Supply Co., 920 Plum St., Elkhart, Ind., headed by Frank E. Miller, while central Indiana is covered by the Voyles Equipment & Engineering Inc., 2258 Meridan St., Indianapolis, headed by Richard M. Voyles.

**Thompson Products Inc.,** 23555 Euclid Ave., Euclid, O., plans a $5-million engineering center. Construction is to start this year. Scheduled for fall starts are an automotive development and metallurgical-chemical laboratories. Three other major structures are planned for completion by the end of 1958—an administration building, a new-devices laboratory and an industrial engineering building.

**Baldwin-Lima-Hamilton Corp.,** Philadelphia 42, has made a cross-licensing agreement with Carl Schenk, Darmstadt, Germany. Baldwin will manufacture and sell the Schenk line of fatigue testing equipment. The firm of Carl Schenk will manufacture and sell Baldwin's bonded resistance wire strain gages, testing machines and associated instrumentation.

**Western Sealant Co.,** 9999 West Jefferson Blvd., Culver City, Calif., now has plants for the impregnation of castings in all principal cities of the United States and Canada. Newly elected president of Western Sealant is Charles H. Lundquist. He was formerly associated with the Consolidated Western Steel Division, United States Steel Corp.

**Kaiser Aluminum & Chemical Corp.,** Chemicals Div., will build a $4-million plant to produce basic refractories at Columbiana, O. The plant, scheduled for completion before the end of this year, will produce basic brick and ramming mixes made of magnesia and chrome.

**J. C. Steele & Sons Inc.,** 702 Mulberry St., Statesville, N. C., is building a new foundry for the production of steel and alloy castings. Electric furnaces are to be installed in a 20,000 sq ft foundry and pattern shop building.

**General Mold Casting Corp.,** has moved its offices and plant to new and larger quarters at 18 St. Francis St., Newark 5, N. J.

**Consolidated Foundries & Mfg. Corp.,** Wilmington, Del., has acquired Available Truck Co., Chicago, Consolidated Foundries Inc., Chicago, and Iowa-Michigan Corp. Available Truck Co., produces crane carriers and other custom truck chassis. Consolidated Foundries Inc., operates four divisions: Crucible Steel Casting Co., Milwaukee; Michigan Steel Casting Co., Detroit; Western Foundry Co., Holland, Mich.; and Ebaloy Foundries Co., Rockford, Ill. Iowa-Michigan Corp., operates two divisions: Misco Precision Casting Co., with plants in Detroit and Whitehall, Mich., and Iowa Soap Co., a producer of natural soap products.

**Electric Steel Foundry Co.,** 2141 N. W. 25th Ave., Portland, Oreg., will erect a three-story laboratory building estimated to cost $175,000. The building will measure 50 x 100 ft. Metallurgical laboratory will occupy the first floor; other floors will be used for an auditorium, future office expansion, storage and recreation.

**Waupaca Foundry Inc.,** 108 North Division St., Waupaca, Wis., has been sold by Mrs. Charles Dombrowski to Clifford W. Schwenn. Mr. Schwenn recently resigned as vice president and director of manufacturing at the Brillion Iron Works Inc., Brillion, Wis.

**Eclipse Fuel Engineering Co.,** Rockford, Ill., has appointed E. C. Konkle Co. its distributor for the state of Virginia. Konkle maintains offices at 106 South Third St., Richmond, Va., under E. C. Konkle, and at 1336 East Drive S. W., Roanoke, Va., under R. V. Dodge.

**Kilbourn Pattern Co.,** Milwaukee, has been organized to manufacture wood and metal patterns and models. Authorized capital stock is 200 shares of common, no par value. Herbert Gans, 347 East Stewart St., is registered agent of the corporation.

**Western Foundry Co.,** Tyler, Tex., has enlarged its facilities and increased its production by 35 per cent. The firm has added 120 workers, giving it a total of nearly 900 employees.

**Acme Ironworks Ltd.,** 182 Wall St., Saskatoon, Sask., Canada, has changed its name to Acme Industries Ltd. The business address remains the same.

**Nordberg Mfg. Co.** has contracted with Meehanite Metal Corp., New Rochelle, N. Y., to produce Meehanite castings in its foundries in St. Louis and Milwaukee.

## WHEELABRATOR® STEEL SHOT

# COSTS 62% LESS

### at HOOSIER IRON WORKS

## MAINTENANCE COSTS ARE SLASHED, TOO

Abrasive costs per ton of castings cleaned were slashed from 75c to only 28c when Hoosier Iron Works, Kokomo, Ind., switched to Wheelabrator Steel Shot.

An additional saving was effected in the 15% to 33% longer life of wearable machine parts.

Manufactured under rigid control every step of the way, this premium electric furnace steel shot is made tough, hard and uniformly round. These properties make Wheelabrator Steel Shot last much longer, reducing abrasive costs. These same properties cut maintenance costs because they eliminate excessive machine-parts wear from sharp edges of broken shot.

*Write for Bulletin 89B.*

**PERFORMANCE AT HOOSIER IRON WORKS**

| ABRASIVE | Chilled Iron Shot and Grit | Wheelabrator Steel Shot |
|---|---|---|
| Tons of Castings Cleaned | 1018 | 1078 |
| Pounds of Abrasive Consumed | 13,400 | 2450 |
| Cost of Abrasive Per Wheel Hour | $2.84 | $1.07 |
| Pounds of Abrasive Consumed Per Ton of Castings | 13.2 | 2.3 |
| Abrasive Cost Per Ton of Castings | 75c | 28c |

*note*

Price alone does not determine cost. Although the original price of Wheelabrator Steel Shot is more than that of chilled iron its actual cost for Hoosier Iron Works is less than half. Premium performance brings costs down.

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**AMERICAN WHEELABRATOR & EQUIPMENT CORP., 505 S. Byrkit St., Mishawaka, Indiana**

## Attention to Details Pays Off in Maintaining

# CASTING QUALITY

By BYRON E. KENNEL
*Assistant Editor*

PROVIDING customers with an engineering service sells castings and makes possible foundry expansion. Such is the experience of Multi-Cast Corp., Wauseon, Ohio. Since Jan. 1, 1952, when Edward J. Metzger took over the ownership and operation of the foundry, sales of aluminum and bronze castings have more than doubled, and plant area has increased from 4500 to 10,000 sq ft. Aluminum and its alloys account for two-thirds of the plant's production, brass and bronze alloys for the remaining third. Monthly shipments range from 30,000 to 40,000 lb.

Management of the foundry emphasizes accurate costing of jobs and high quality standards. Low scrap and low customer return percentages have been achieved by a control system that starts before the patterns reach the foundry. Costs of each job are estimated and later rechecked, following closely the methods given in the Non-Ferrous Founders' Society manual, *Basic Cost Principles,* to which Mr. Metzger was a contributor.

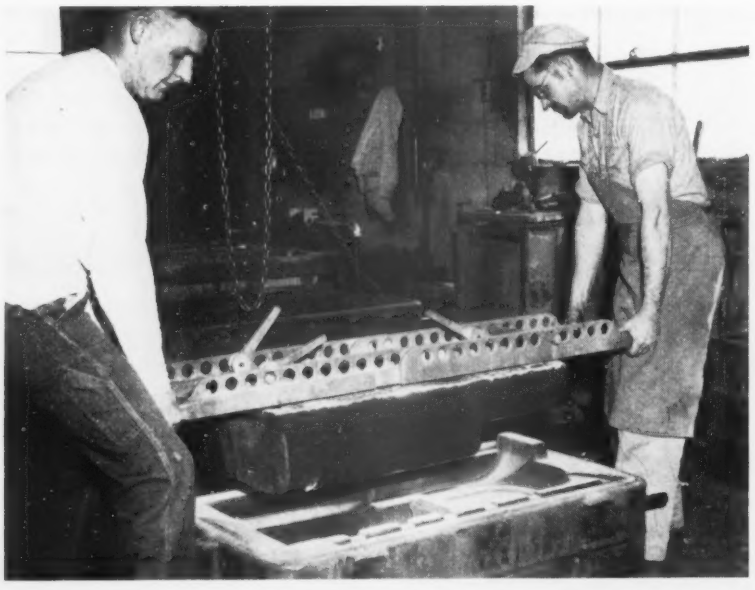
Production of castings starts with patterns. At Multi-Cast every effort is made to see that patterns are engineered for low scrap and economical production. Before an order goes into production, the pattern equipment is brought into a well equipped, 26 x 37-ft pattern rigging room. There gating is designed, and the pattern is checked to make sure it is in good repair.

Most of the patterns run in the foundry are either loose or mounted on matchplates. Others are mounted on cope and drag boards. A jointer, a table saw, a band saw, drill presses, a wood lathe and sanders equip the pattern rigging room. Both patterns and castings are checked on a 50 x 75-in. layout table when required. A pattern record system is used which gives the foundry any special instructions needed.

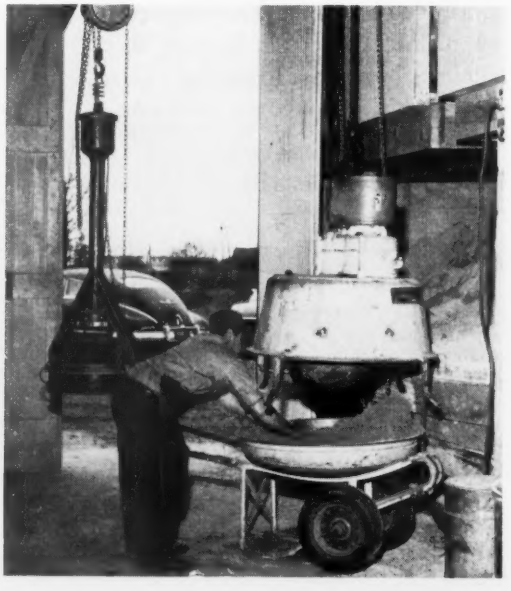
Operating staff of the foundry is made up of seven molders, three core-makers, one melter, four cleaning room employees and six laborers. This staff is supervised by men who have had many years experience in nonferrous operations. Three of the molders work on portable jolt squeeze machines on which matchplate patterns are run. A heavier molding floor is equipped with a jolt pin lift and rollover machine. Part of the molding area is set aside for

Overhead crane system provides hoists wherever needed. Here core segments are being set

Green sand cores have special arbors to give support. The lifting mechanism is released after core is set in the mold



Sand is shoveled into gyratory sifter before it is mixed in a portable mixer



## The man who uses your castings can MACHINE UP TO 35% MORE CASTINGS PER TOOL

Iron deoxidized with FERROCARBO® patented Briquettes is *premium* iron... free from segregations, inclusions, and deep hard chilled spots. It is more easily machined, adds up to 35% to the life of cutting tools...often permits increases in machining speeds. In addition, the castings you supply are finer-grained, denser, stronger than castings made from untreated iron.

You benefit, too, because iron deoxidized with FERROCARBO® is more fluid, flows more readily into thin sections . . . reduces misruns. Silicon recovery increases materially, allowing you to charge more scrap and still produce better castings.

**GET THE COMPLETE STORY** today. Call your FERROCARBO Distributor — or write for your free copy of "Producing Superior Gray Iron Castings." Address: The Carborundum Company, Dept. F84-44, Niagara Falls, N. Y.

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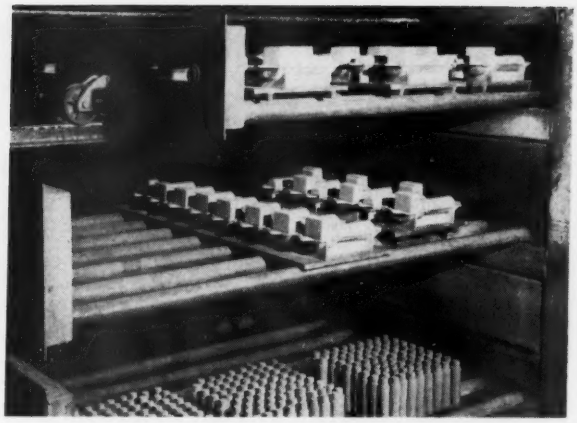
84-44

floor molding. Green sand cores are used on some jobs and are made in the foundry; special arbors are used for support. Cores are removed from coreboxes with a special hydraulic stripping machine. A lifting mechanism attaches to the arbors until the cores are set in the mold.

An overhead crane system provides hoists for each molding floor when needed and conveys molten metal from the furnaces. The crane system has a double runway which covers the entire 42 x 72-ft molding bay. Capacity of the crane system is 2 tons. Castings weighing up to 1000 lb have been made in the foundry.

Coreroom facilities include benches for hand coremaking and a cartridge type coreblowing machine. Larger cores are made on rollover equipment. Cores are baked in a drawer-type recirculating oven, with automatic controls. Each end of the oven has four drawers; at each level one of the drawers may be inside the oven in the baking zone while the other is pulled out for loading or unloading. A direct-reading temperature gage is located on the outside of the oven. An Iron Lung directly over the oven exhausts fumes from the core baking operation.

Base of the core sand used is a bank sand of 125 AFS grain fineness. Clay content is less than 1 per cent. Several core sand mixes are used of which the following is typical: 275 lb of sand are mixed for 1 minute with 2 qt of cereal; 4 qt of water are added and mixed for 2 minutes; 2 qt of urea binder and 1½ pt of kerosene are added together and mixed with the sand for 3 minutes. This sand is used for cores in aluminum casting. It provides a good surface finish with quick collapsibility for low-temperature alloy use. Kerosene is added because of its action as a release agent. Handling characteristics of the cores are good. For bronze castings the following mix is used: 275 lb of sand are mixed with 2 qt of oil and 1½ qt of cereal for 2 minutes, 4 qt of water are added, and mixing is continued for 3 to 5 minutes.



Each end of the core oven has four drawers. Those from one end are in the baking zone as green cores replace the baked cores at the other end of the oven

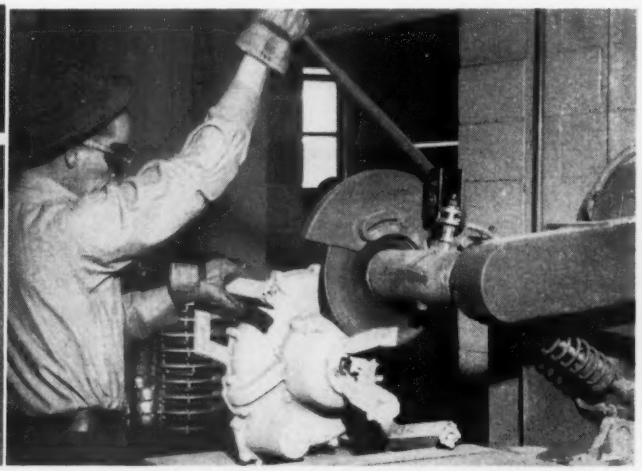
Sand is stored in two 20-ton capacity bins. In the mixing process sand is shoveled from the bin to a gyratory sifter which sifts the sand into a portable mixer and removes any foreign materials. After mixing, the sand is taken to the point of use. The sand used for molding aluminum is a naturally bonded sand containing 15 per cent clay. Its AFS fineness number is 160 and its permeability 15. Molding sand for brass is composed of a mixture of two naturally bonded sands. One is a local sand of 80 to 90 AFS fineness and 35 permeability; the other is a New Jersey Millville gravel with a fineness of 50. These two sands are blended according to the requirements of the jobs being run. Molding sand is tempered and aerated on the floor by a portable aerator with a 12-in. belt.

Metals poured in the foundry include aluminum bronze, beryllium copper, nickel bronze, tin bronze, manganese bronze and various aluminum alloys for both general purpose and heat-treated applications. Two dip-out furnaces are used for melting aluminum, one of 300 and one of 600-lb capacity. Three furnaces are used to melt bronze, each of 450-lb capacity. Two are pit-type crucible furnaces; the other is a tilting furnace. Blowers developing 16 oz wind pressure provide air.

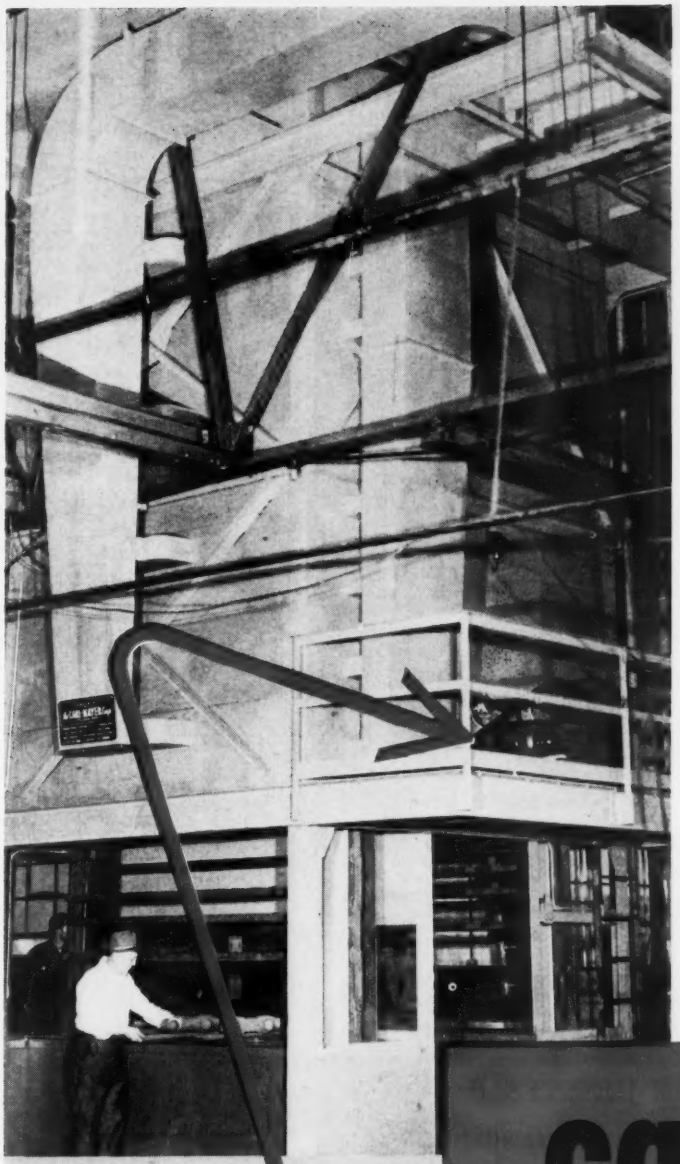
Oil-pumped nitrogen is used for degassing. From 10 to 30 minutes, depending on the volume and temperature of the metal, is required. Temperature readings are made before the metal is poured.

Cleaning room equipment includes two abrasive belt grinders with serrated contact wheels for faster grinding. Two are 14-in. wheels, one of which runs at 1800 rpm, the other at 2200 rpm. Aluminum oxide grinding wheels are used for snagging. A tumble blast cabinet is used for castings requiring sand blasting. A bandsaw and a cut-off machine with an adjustable table are

Temperature reading and degassing are required before aluminum is poured. Plant also pours nickel, tin and aluminum bronze, beryllium copper and other alloys



Gates and risers are removed by a cut-off machine with an adjustable table. High-alloy bronze gates are notched and then broken off with a hammer blow



# another carl mayer first

## VERTICAL CORE OVEN WITH INTERNAL HEAT FAN

The vertical oven illustrated here is specially designed to give high operating efficiency . . . greater production economy. Location of the heat fan inside the oven (Patent No. 2,628,087) reduces heat loss, lowers installation and maintenance costs and eliminates smoking.

The recirculating heating system with sealed combustion chamber located between the conveyor chains is an exclusive CARL MAYER feature (Patent No. 2,257,180). This prevents hot combustion gases from going directly into the oven chamber, eliminating non-uniform temperatures and burned cores.

For further details write for our bulletin No. 53-CM . . . or ask for a representative to call.

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OTHER PRODUCTS: Heat Treating Ovens and Furnaces • Rod Bakers • Welding Rod Ovens • Paint and Ceramic Drying Ovens • Special Processing Equipment and Accessories

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JUNIATA Bank Sand is by nature adaptable to the most essential physical requirements of an ideal foundry sand. Good grain distribution, high surface tension and excellent heat resistant properties.

JUNIATA Bank Sand is produced under strictest quality control. Selection of each customer's shipment is made with the determined purpose of duplicating previous shipments, thus ensuring every user a high degree of uniformity.

JUNIATA Bank Sand deposits encompass a wide range of grains. Careful choice of that grade best suited to our customers' requirements is the number one purpose of the personnel entrusted with this important service.

**MOLDING SANDS**
**CORE SANDS**
**SILICA SANDS**
**SHELL SANDS**
**BLAST SANDS**
**BENTONITES**
**BONDING CLAYS**
**WOOD FLOUR**
**FIRE CLAYS**
**SHOT AND GRIT**
**MALLEABRASIVE**
**ABC COKE**
**REFRACTORIES**

## GREAT LAKES FOUNDRY SAND CO.

**UNITED ARTISTS BUILDING, DETROIT, MICHIGAN**

used to remove gates and risers. On high-alloy bronze jobs, the risers are not cut off, but merely notched and then broken. All machines in the cleaning room are connected to a dust collection system.

## OBITUARY

**THOMAS S. QUINN,** 67, co-founder and treasurer, Lebanon Steel Foundry, Lebanon, Pa., died Feb. 20, in Miami, Fla. He entered the steel industry in 1907, working on blast and open hearth furnaces of Colorado Fuel & Iron Co., Pueblo, Colo. Later he was associated with American Iron & Steel Mfg. Co., Reading and Lebanon, Pa., Lebanon Steel Casting Co., and Treadwell Engineering Co., Easton, Pa. In 1911, with William H. Worrilow, he founded Lebanon Steel Foundry. He resigned his duties as general manager last year, continuing as treasurer. Mr. Quinn was an active member of the AFS, AIME, ASTM, and the American Iron and Steel Institute.

* * *

**Raymond I. Deutsch,** 72, president, Monarch Aluminum Mfg. Co., Cleveland, died Feb. 27, in Boca Raton, Fla. After attending Cornell University, he joined his father's firm, Monarch Brass Co. A pioneer in the aluminum industry, in 1912 he organized one of the early foundries, which later became Monarch Aluminum Mfg. Co. Mr. Deutsch served as vice president of the Aluminum Association, last year.

* * *

**Aubrey J. Grindle,** 65, president of the Grindle Corp., Harvey, Ill., and a former vice president of Whiting Corp., died Mar. 13 in Marion, Ind. Mr. Grindle, who pioneered the successful application of pulverized coal in firing malleable iron melting furnaces, joined Whiting when Grindle Fuel Equipment Co. became a subsidiary. While at Whiting he was manager of the foundry equipment department, vice president of foundry equipment sales and consulting metallurgical engineer. In 1951 he served as chief of the Foundry Equipment and Supply Section, NPA, Washington, and later that year became president of Foundry Services & Equipment Corp., and Air Purification Corp., Markham, Ill. They consolidated in November, 1951 under the name of Grindle Corp. Mr. Grindle was vice president of the Foundry Equipment Manufacturers' Association in 1950-51.

AUBREY J. GRINDLE

* * *

**Ted C. Kaplysh,** 41, for the past 3 years personnel manager, Grabler Mfg. Co., Cleveland, died Feb. 26. A graduate of Ohio University, Mr. Kaplysh was previously engaged in personnel work with Allyne-Ryan Foundry Co., and Diesel Division, General Motors Corp., Cleveland.

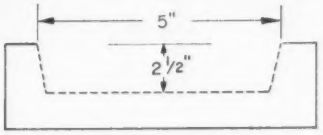
* * *

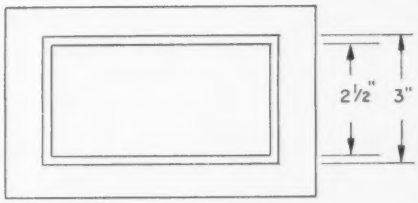
**John Lloyd,** 91, until his retirement vice president - treasurer, Royer Foundry & Machine Co., Kingston, Pa., and a member of the firm of John Lloyd & Sons, consulting engineers, died Feb. 11, in Wilkes-Barre, Pa.

* * *

**Arthur A. Maes,** 66, until his retirement a year ago assistant treasurer and traffic manager, Chicago Hardware Foundry Co., North Chicago, Ill., died Mar. 3.

## HOW TO DO IT




# Homemade Alloy Briquets Aid Pouring of Sound Castings

HERE'S how a foundry solved a problem of adding 300 lb of ferroalloys, copper, molybdenum and chromium, to a high steel content mix from which 8000-lb high test iron castings were to be poured. Cupola would melt only 4 tons per hr, and three taps into the pouring ladle were required.

The practice of adding one-third of the alloys through a funnel to the metal stream on the first, second and third taps, plus long periods between taps caused excessive metal temperature drop even when metal in the ladle was covered by exothermic material between taps. Occurrence of dirt inclusions and occluded gas holes in the cope side of castings was traced to the low metal pouring temperature.

After some study, all the alloys were mixed together, combining 4½-lb of alloys with 1 lb portland cement dampened to a good ramming consistency. This mixture was rammed into briquets in a homemade rollover corebox and allowed to dry for 24 hr. Briquets were added in evenly divided amounts to the high steel mix in the cupola on the second, third and fourth charges. No briquets were added on the first, fifth and last charges.

Alloy loss on melting was less than 1 per cent. Metal temperature was maintained by covering each tap in the ladle with exothermic material, which was skimmed later. Good clean castings resulted with metal poured at a fairly high temperature.

**Do you have any tricks of the trade tucked away with your foundry experience? Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $15 for each idea submitted and published. Send a photo or drawing with your idea.**

# FOUNDRY DEVELOPMENTS

By EDWIN BREMER

*Metallurgical Editor*

DEMONSTRATION of a recently developed technique for converting high-energy x-rays into visual images was given at the recent open-house held by the National Bureau of Standards. X-rays generated by a betatron are projected through the object being examined; the image produced is converted into an optical image by a pattern amplifier employing a large cylindrical thallium-activated sodium iodide crystal. Visual image may be observed directly by eye, photographed with an ordinary camera or observed with a remotely controlled television camera. In the demonstration a small one-cylinder engine in operation was used, and the moving piston, piston rod and other parts could be seen clearly.

## Core Binder

NEW acrylic resin shows excellent promise as a core binder. Available in aqueous form, it is said to be stable indefinitely when protected against evaporation. Used in the ratio of 1 part by weight to 100 parts sand, the resin exhibits a green strength of over 1 psi which increases with air drying, and a baked strength around 180 psi. It is claimed that no fumes are given off during baking, that the cores have excellent collapsibility, and are removed easily from the castings.

## Vapor Deposition

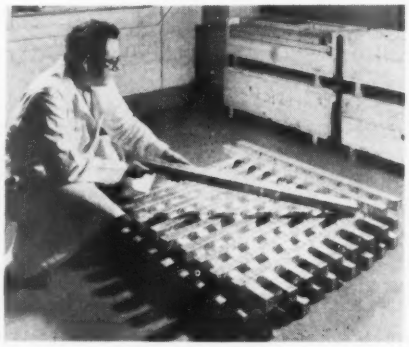
WEAR-RESISTANT coatings of molybdenum can be made on titanium and titanium alloys by vapor-depositing techniques described in two reports released by the Office of Technical Services. Reports are PB 111533 and PB 111534. They have the same title—"Methods of Vapor Deposited Coatings for Titanium and Titanium Alloys" and may be obtained for 75 cents each from the Office of Technical Services, U. S. Department of Commerce, Washington 25.

## Vacuum Annealing

HYDROGEN has a deleterious effect on titanium, as indicated by tensile strengths of 60,000 psi compared with 160,000 psi when the gas is removed by annealing under a high vacuum. To provide this annealing service on a commercial basis the recently formed Kinetics Corp., Boston, uses high-vacuum furnaces designed and manufactured by High Vacuum Equipment Corp., Hingham, Mass. Retorts of the furnaces have a "hot zone" 26½ in. in diam and 27 in. long for accommodation of castings, billets, strips and other forms of titanium, zirconium or other metals and alloys.

## Control Standard

LABORATORY and production quality control standards of a zinc-base alloy soon will be available to all industry as the result of a joint



project by General Motors Research Laboratories, National Lead Co., and the National Bureau of Standards. Developed for use with the spectrograph, the standards are segments of the zinc alloy about 1 in. long and 1¾ in. in cross section. They were cut from a continuously-cast bar 333 ft long. Composition of the standards will be determined accurately by laboratory tests, which include chemical, spectrographic and metallographic analyses. Preparation of the standards was financed by GM Research Laboratories, and the casting of the bar was conducted at National Lead Co.

## Fine Finish

PRODUCTION research by Aluminum Co. of America has made possible an improvement in the finish of aluminum die castings as they come from the die. A hardware class finish is claimed on die-cast parts without additional processing being required. In the past, aluminum die castings had to be subjected to additional finishing operations before chrome plating. With the improved finish they can be plated with very little more effort than is required for zinc die castings. Parts can be buffed to a high polish and lend themselves to other mechanical and painted finishes.

## Upgrading Iron

IMPROVEMENT of commercial gray irons always has been of interest to foundrymen, and Armour Research Foundation of Illinois Institute of Technology carrying on investigations for General Chemical Division, Allied Chemical & Dye Corp., has obtained some interesting results. Using chemical inoculants in gray cast iron, significant improvements in transverse and tensile strengths as well as resistance to growth have been found. Microstructures indicate properties which will be adaptable to the current trend in heat treatment. Work now is being conducted in production foundries to ascertain the over-all development.

## An Iso-topic

CONTRIBUTION of ceramic ladle nozzles to inclusions in steel castings was studied at Armour Research Foundation of Illinois Institute of Technology by use of a neutron-bombarded nozzle. Radioactive ceramic was employed in a standard pouring procedure under commercial conditions. Inclusions in four test castings were surveyed for activity with scintillation and Geiger counters. No inclusions were found containing radioactivity, eliminating the nozzle as a possible source of included material.

## Impregnation

CERAMIC ladle nozzles used by the steel industry are being impregnated with a special tarry material by the Wood Preserving Division, Koppers Co. Inc. The tar material, a high-coke residue tar, is forced into the porous nozzle under pressure by the same process and in the same equipment used in the pressure-treatment employed in preservation of wood. It is claimed that the treatment makes the nozzles able to withstand sudden application of high temperatures without spalling or cracking.

# Why does the SPEEDMULLOR Use Less Power?

A 125 horsepower motor (in the 80A Speedmullor) operated for one minute, consumes far fewer *K.W.H.* than a 75 horsepower motor operated for three or more minutes. Because the Speedmullor thoroughly mulls molding and core sands to *maximum physical properties in less than one-third the time* required in a conventional mixer, it uses fewer K.W.H. of electrical power per ton of sand. Electric bills are based on K.W.H. . . . you pay for K.W.H. and not horsepower. Your costs are determined by K.W.H. per ton of sand mulled.

Modern high speed mulling pays off in capacity too. The 80A Speedmullor *fully mulls* more sand per hour than any other mill.

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**BEARDSLEY & PIPER** DIVISION OF
**PETTIBONE MULLIKEN CORPORATION**
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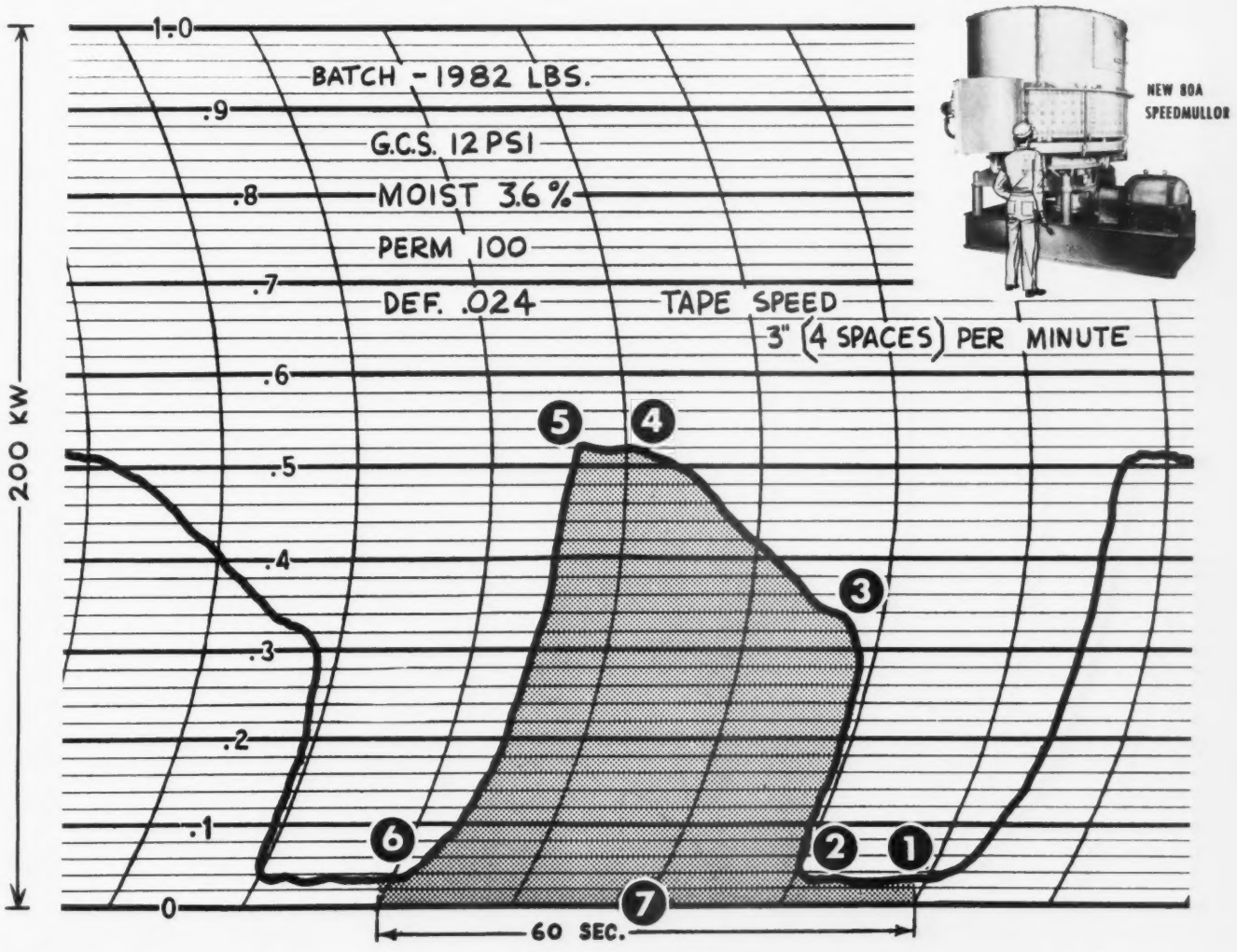
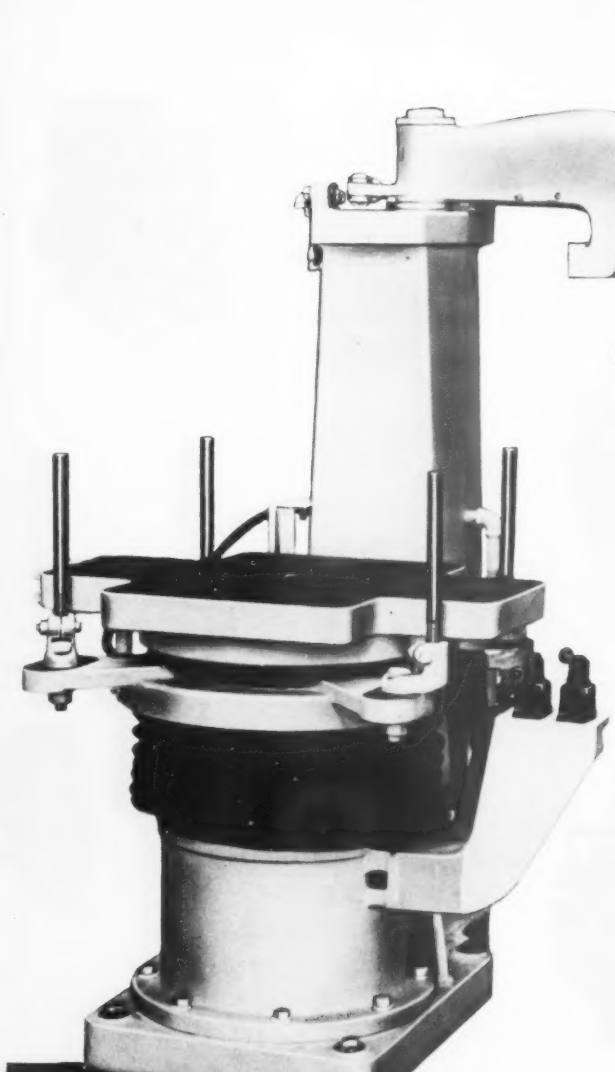
**AN ACTUAL POWER GRAPH RECORD OF A 1982 LB. BATCH OF MOLDING SAND MULLED IN AN 80A SPEEDMULLOR.**

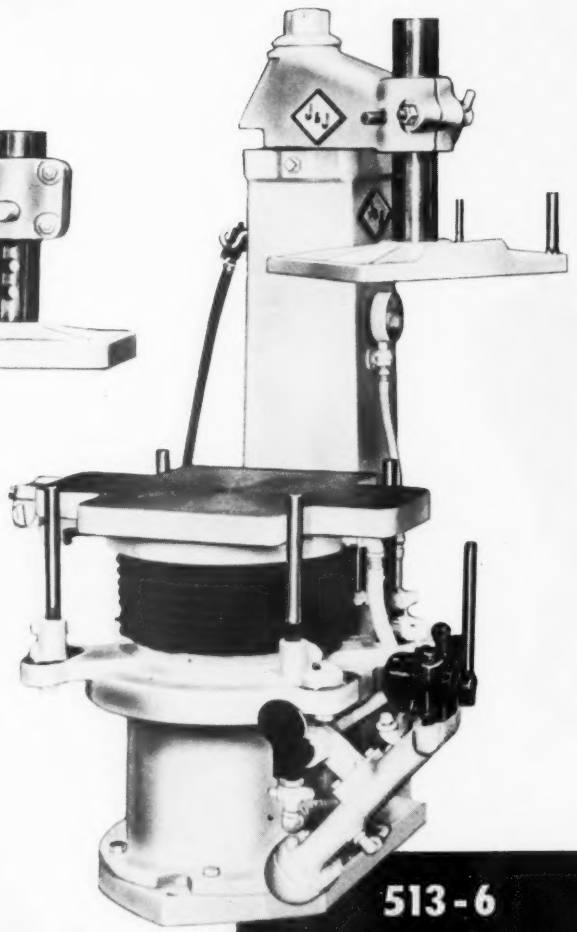



1. Flush water is introduced.
2. Batch of sand and bonding additions charged.
3. "Temper water is added and strength starts developing.
4. The maximum physical properties are attained after 45 seconds . . . green compressive strength—12 p.s.i.
5. Batch is discharged after 51 seconds.
6. Discharge complete in 9 seconds (⅓ to ½ the time required by conventional muller).
7. Total elapsed cycle time—60 seconds . . . average horsepower for cycle—81.66 . . . total power consumed—1.02 K.W.H. to fully mull 1982 lb. batch.

# The Only Completely NEW
# JOLT SQUEEZE PIN-LIFT Machines



**716-8**
7" jolt cylinder
16" squeeze cylinder
8" pattern draw
24" x 34" table



**513-6**
5" jolt cylinder
13" squeeze cylinder
6" pattern draw
19" x 26" table

Brand new in design and featuring an exclusive concentric draw cylinder guided by a full-circle bearing area around the large squeeze cylinder, the J&J 513-6 and 716-8 offer the most accurate draw obtainable with this type of machine.

Internal guides are hardened and ground to assure retained accuracy of draw. The jolt of the 513-6 is knee-valve-controlled, while a single hand-valve controls both squeeze and draw. Two convenient pilot valves control all operations on the 716-8. Both machines feature positive, controlled slow and fast draw on the same stroke, with automatic vibrator control.

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DIVISION OF **BEARDSLEY & PIPER**
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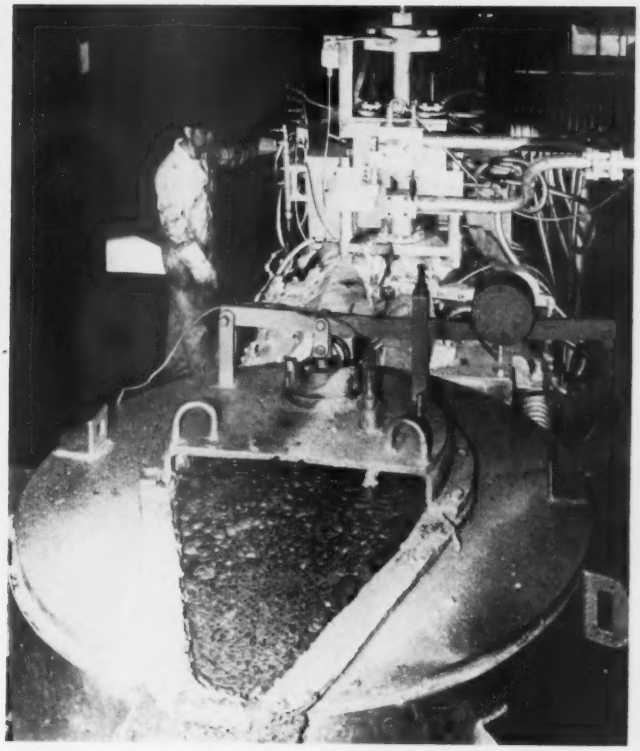
2424 North Cicero Avenue • Chicago 39, Illinois

In semi-automatic operation, operator removes the casting, lubricates sprue area and checks casting



Top view of hot chamber die casting machine shows how holding pot holds supply of molten magnesium

# DIE CASTING MAGNESIUM

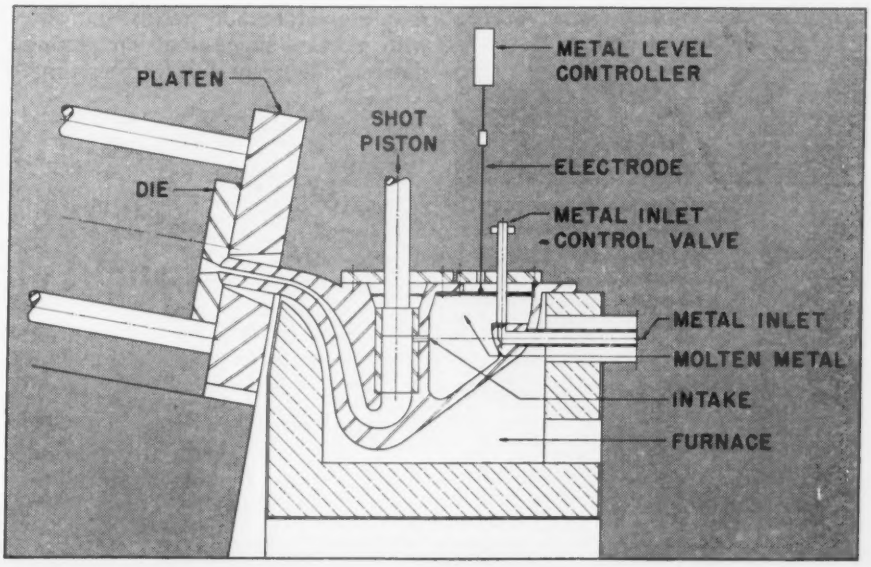
## in a Hot Chamber Machine

HOT chamber die casting machines for magnesium are on the way. Dow Chemical Co., Midland, Mich., has developed such a unit and claims that it can turn out magnesium castings at a metal cost of 19½ cents per 10 cu in.

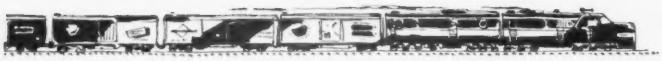
Dow's developmental work began in 1944, when the company purchased a conventional 70-ton zinc hot chamber machine to develop for use with magnesium alloys. Although it was discovered that this machine could be operated with a flux cover over the melt, there were enough drawbacks that the search for a better method was continued. In 1949, the flux-covered pot design was discarded in favor of a closed unit. The present method of operation uses a supply pot or furnace to hold enough metal to meet demand fluctuations.

A gravity flow or siphon pipe carries molten metal to the injection gooseneck, and an electrical float indicates the metal level in the gooseneck and controls it closely by automatically opening and closing the supply line valve. A hydraulically operated piston forces metal through a closed injection gooseneck into the die, as it does in a standard zinc hot chamber machine.

The new machine can be set to run automatically so that ingot charged at one end can be taken away in the form of die castings at the other. Usually, however, the complexity of the part requires that the operator give the die close attention. Therefore he carries out




Die casting machine has a hydraulically operated piston to force molten metal in the die



**NOT A CORE** *in a carload*

*...but* **A LOT MORE CASTINGS**

*with* **DUREZ**

*...the preferred shell molding resin*

**Here is an example** where a change-over from sand casting to shell molding paid off in three major cost factors . . . production of the raw castings, shipping weight, and finishing.

**By casting these gray iron** auto valve port sleeves in shell molds bonded with Durez resin, Wright Casting and Manufacturing Co. eliminated the need for a separate window core. Weight reduction resulting from the new method was more than 50%, lowering freight charges proportionately. A roughing operation was also eliminated and the shell molded iron is easier to machine.

**Like other leading foundries,** Wright Casting is sold on Durez resins from experiences of this kind. When you get really fast curing, with mold rigidity that ends the need for a window core, it's a hard-to-beat combination.

**Durez can help you** not only with shop-proved foundry resins, but also with practical suggestions for getting the results you want. Just write anytime.

DUREZ

PHENOLIC RESINS

MOLDING COMPOUNDS

INDUSTRIAL RESINS

PROTECTIVE COATING RESINS

*Made by America's largest producer of phenolic plastics exclusively.*

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**SHELL MOLD RESINS THAT FIT THE JOB**


any required lubrication of the die, starts the casting cycle and removes the finished casting. A wide range of castings can be made with one size of piston because the injection stops automatically when the mold is full.

In the die casting process, a holding pot always is used to supply metal continuously to the casting machine, usually very close to the charging end, beside the operator. With the new unit, the holding pot can be located in the melt room so that a wall can separate it from the casting machine. This arrangement makes it possible for the melter to service the pot without interrupting the production of castings.

With the advent of the hot chamber process for magnesium, greater advantage can be taken of the metal's properties. Magnesium requires a low amount of heat per unit volume to melt, and it can be handled in steel equipment without dissolving iron. Dissolved gases and included refractory particles are not a problem. When molten, the metal can be transferred readily by pipeline under pressure created by mechanical pumps or static head. Refining techniques can be improved by the use of mechanical steel stirring equipment.

Balanced against the advantages of the magnesium hot chamber machine are several less favorable factors. Purchase price is about 50 per cent greater than that of a cold chamber unit of equal clamp tonnage. Also, the machine is designed for high-volume, continuous production and is not well suited for one-shift use. Present design is limited to magnesium alloys in the 6 to 11 per cent aluminum range. Maximum finished weight of castings is 2 lb.

## Management Conferences Are Scheduled for Supervisors

Management conferences designed to teach management personnel how to supervise foremen and supervisors will be held in Traverse City, Mich. Dates scheduled for those attending for the first time are May 2 to 6, Aug. 8 to 12 and Oct. 3 to 7. Conferences for those attending their second year will be held Apr. 4 to 8, July 18 to 22 and Oct. 17 to 21.

Each conference group is limited to 20 persons and is guided by a proved leader. The fee for the five day conference is $200 and does not include housing and meals. Further information may be obtained from the Industrial Training Service, 213 North Pine St., Lansing 15, Mich.

Henry Crown, industrialist, chairman, president and director in mining, construction, railroad and management fields, sole owner of New York's Empire State Building, which attracts more than a million visitors annually to the observatories on this 1472-foot high building.

# "I multiply my eyes and ears when I read Business Publications"

**says**

**Col. Henry Crown,**

**President, Empire State Building Corporation**

"I can't possibly know everything about every industry in which I am vitally interested," Col. Crown continues, "but through business publications I keep in touch with the important developments in construction, transportation, mining and the operation of hotels and office buildings. My associates, too, make constant use of the business periodicals covering their special fields."

Top management reads business publications because the writers and editors of those periodicals deliver pertinent and specific news coverage. That's why business magazines provide an ideal sales channel for any product or service of sound benefit to business or professional men.

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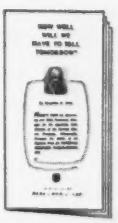


# It's hard to compete with the low-cost producer

AND the better use you make of modern molding machines, the tougher it gets for your competition.

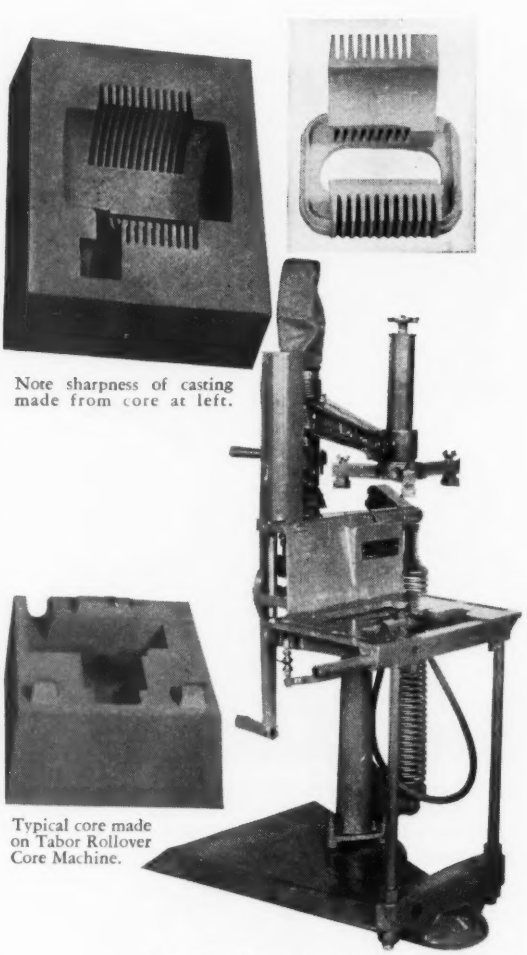
Take, for instance, the Tabor Rollover Core Machine. This *low-cost* producer will . . .

- boost your production of cores 30 to 40%
- perform well on all cores, medium to large in size, including the most intricate, with deep, precision draws
- produce cores true to size; insures uniform metal thickness
- eliminate rapping. Draw is facilitated by a Tabor vibrator
- save production time, for this machine is fast and very easy to operate.

Hundreds of Tabor Rollover Core Machines are operating in foundries today where accurate cores are a necessity.

MR. FOUNDRYMAN:

With a surprisingly small outlay of capital you can install this Tabor *low-cost producer.* This machine usually pays for itself in two months. No other machine can match the performance you'll get from a Tabor Rollover Core Machine . . . and it's priced many times lower than any competitive equipment available to the industry today. Write for full details or quotation.



Note sharpness of casting made from core at left.

Typical core made on Tabor Rollover Core Machine.

Tabor Rollover Core Machine. Two sizes:
4" Draw — for boxes up to 12" x 20" x 7".
8" Draw — for boxes up to 14" x 24" x 12".

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Jarring Machines • Rollover Machines
Abrasive Cut-Off Machines • Vibrators

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**TURBO MACHINE COMPANY**
**LANSDALE, PA.**

# WISCONSIN CONFERENCE

## Program Covers Many Phases of Foundry Practice

Studying the conference program, left to right, are: Prof. E. R. Shorey, University of Wisconsin; C. V. Nass, Beardsley & Piper Div., Pettibone-Mulliken Corp., Chicago; R. V. Osborne, Lakeside Malleable Castings Co., Racine, Wis., chapter chairman; F. J. Dost, Sterling Foundry Co., Wellington, O., national AFS president; Dean K. F. Wendt, of the university

By EDWIN BREMER, *Metallurgical Editor*,
ROBERT H. HERRMANN, *Associate Editor*, and
ERLE F. ROSS, *Chicago Editor*

EIGHTEENTH in a series of successful foundry conferences sponsored by Wisconsin Chapter of the AFS and the University of Wisconsin drew over 700 to Hotel Schroeder, Milwaukee, Feb. 10-11.

The conference was opened by Wisconsin Chapter President R. V. Osborne, Lakeside Malleable Castings Co., Racine, Wis. After extending a welcome, he introduced AFS National President Frank J. Dost, Sterling Foundry Co., Wellington, O., who reported on the purpose and operations of the society.

Speaking for the University of Wisconsin, Kurt F. Wendt, dean, college of engineering, outlined three problems confronting educational institutions and industry. First is how to attract young men and women to the opportunities of higher education. He cited work of Foundry Educational Foundation and the University of Wisconsin in encouraging college attendance. Second problem is how to attract young men to the foundry industry. The third problem is importance and necessity of research in industry.

Reporting on a recent five-week trip into nine European countries, including attendance at the International Foundry Congress in Florence, Italy, C. V. Nass, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago, stated that foundry productivity in the United States is far ahead of any country abroad.

Of all countries in Europe, Germany has made the greatest comeback since World War II. To their advantage is the fact that their facilities are new, the old having been destroyed. England too has made a nice recovery but its production does not approach that of the United States.

Italy lacks ability for proper organization. Switzerland has the highest standard of living in continental Europe, but has no high-production foundries. France appears to be a nation in peril, yet has some good foundry practice. Belgium has no automotive industry and no high production foundries. Sweden has good equipment and good operations.

First malleable iron session considered **Casting Defects as Related to Sand Practice,** with T. E. Barlow, Eastern Clay Products Department, International Minerals & Chemical Corp., Chicago, as speaker. Although sand properties can cause defects, Mr. Barlow reminded his audience that other things can produce the same faults.

Too much or too little of some additive or some condition of the sand can cause casting defects. To illustrate, the speaker said if the sand is too dry, it has low dry strength; this can cause dirt, cuts, washes and erosion scabs. If the sand is too wet, it has high green strength and thus can produce blows, porosity, pin blisters, scabs, scars, plates, cold shuts, hot tears, cracks, misruns, cuts, washes, erosion scabs, expansion scabs, swells, ramoffs and roughs.

The session ended with an extensive discussion of the pH of sand. The consensus was that in a few years after more experience is gained, this sand characteristic will be regarded as a rather dominant one.

With users of malleable iron castings insisting upon better quality, producers find quality control programs a must. And the first step in quality control is melting control. This was the subject which L. E. Emery, Marion Malleable Iron Works, Marion, Ind., discussed at the second malleable session.

Marion Malleable starts its melting control with strict specifications on raw materials. Great care is exercised in relining and repairing the cupola. A templet is used to assure maintaining standard dimensions in the relining. Mr. Emery pointed out that good cupola operation minimizes additions to be made in the air furnace. A record is kept of cupola iron analysis.

Care also is taken to make sure that air furnace dimensions remain unchanged each time the furnace is rebuilt. A plug is poured in 7 x 2-in. cores and two types of fluidity tests are made. A slag control program also is carried on.

The speaker emphasized that a file card is kept on the running of every job. All details concerning melting and changes which the foundry makes in molding, gating, etc.,

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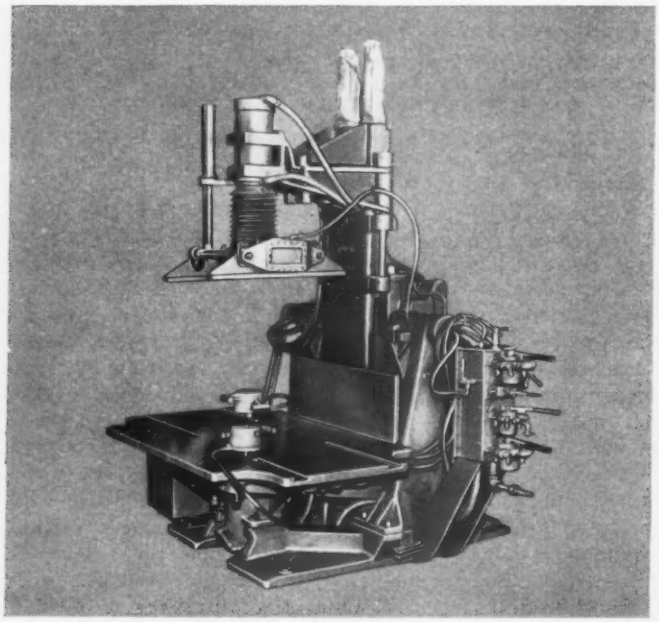
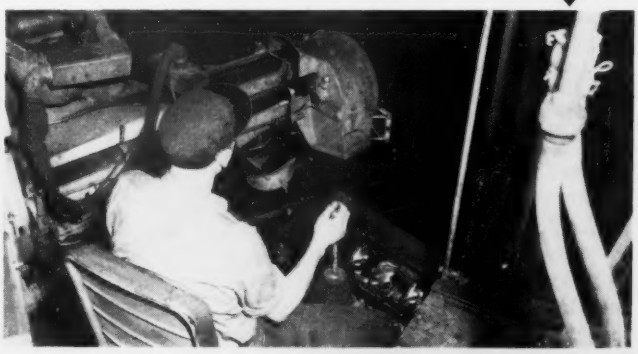
# Modern Equipment Saves Money For Foundries

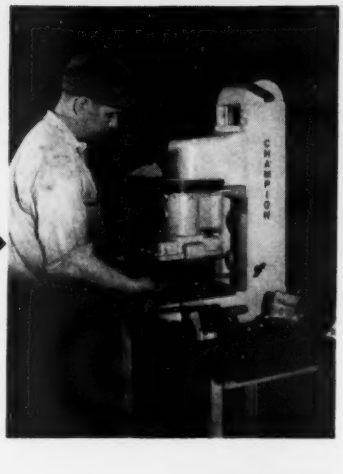
**MAXIMUM CAPACITY,** with full development of molding and core sand physical properties is essential at the Kensington Steel Company. This single Model "70" Speedmullor prepares over 270 tons of molding and core sand daily. Mulling and cooling of molding sand is accomplished in a total cycle of 70 seconds. *For full information write Beardsley & Piper, 2424 N. Cicero Ave., Chicago.*



**JOB CHANGE DOWNTIME** was a problem at one large gray iron foundry until this new J&J Jolt Rol-A-Draw with Automatic Adjustable Flask Equalizer and Automatic Pattern Clamps was installed. Pattern boards are mounted by a "flick" of a single lever, and various flask heights are automatically accommodated. J&J Rol-A-Draws are available with capacities to 10,000 pounds. *Beardsley & Piper, 2424 N. Cicero Ave., Chicago, will provide complete details.*

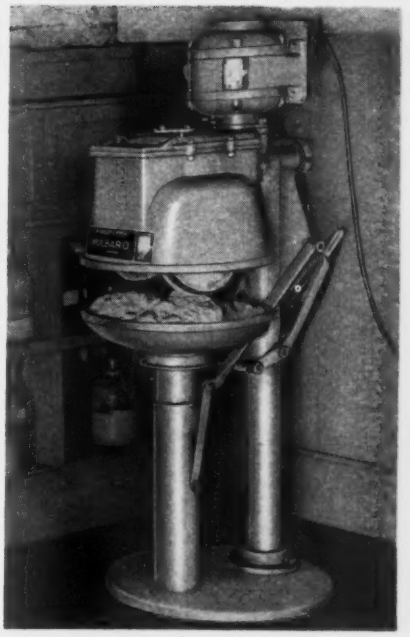
**80 TO 100 LARGE MOLDS** are rammed each hour by this remote controlled Hydra-Slinger at the Belle City Malleable Iron Company. Patterns for eight different jobs are mounted on Champion Speed-Draw Machines on a continuously rotating B&P Rotomold table. The Hydra-Slinger offers effortless, high-speed ramming for jobbing and production foundries. *Write now for full information: Beardsley & Piper, 2424 N. Cicero Ave., Chicago.*





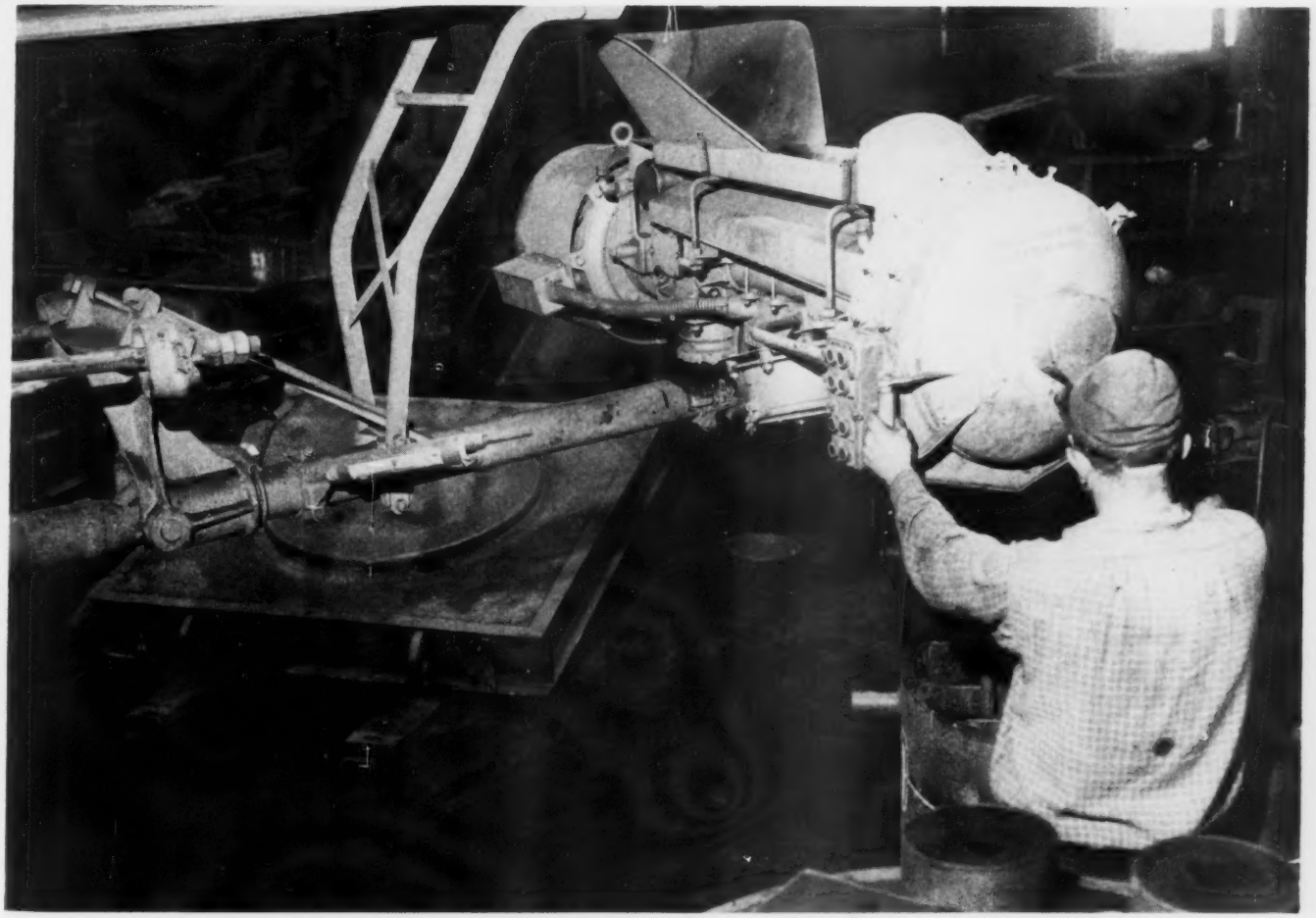

**COREBLOWING FOR THE JOBBING FOUNDRY** is made practical by devices like the quick-change magnetic blow plate holder on this CB 5 Core Blower at the W. D. Allen Mfg. Company. A permanent magnet device in the sand magazine clamps the blow plate securely in position. Locater pins insure exact positioning. To disengage a plate, the operator has only to pull it off. Full details are available. *Write to Beardsley & Piper, 2424 N. Cicero Ave., Chicago.*

**THE MOLDING SAND FOR UP TO 50 FLOORS** is thoroughly prepared daily by this Nite Gang at the G & C Foundry. Shakeout sand heaped on the floors is thoroughly blended and then elevated and discharged over a magnetic separator. The scrap-free sand is then aerated, screened, aerated again and discharged into a pile or windrow ready for use. The machine is self-loading and self-propelling. *For full details, write Beardsley & Piper, 2424 N. Cicero Ave., Chicago.*



**EXACT LABORATORY CONTROL** of sand preparation requires laboratory mulling equipment that will do a thorough job of developing full sand physical properties in minimum time. The compact Lab Mulbaro is designed for fast complete mulling. Mulling bowls are removable to simplify laboratory procedures. *Beardsley & Piper, 2424 N. Cicero Ave., Chicago.*

**MOLDS FOR A LARGE NUMBER** of different castings are produced efficiently by this Tractor Sandslinger at the Forest City Foundries. Cope and drag patterns are mounted on two portable pin-lift machines towed behind the slinger as it moves into the sand heap. Patterns are easily changed, and production from varied patterns is high. Effective mechanization has been attained at very low cost. *For full information write to Beardsley & Piper, 2424 N. Cicero Ave., Chicago.*



**THE MEECH FOUNDRY** is small and space for molding is at a premium. Headroom is only 12′ and the molding bay is less than 30′ wide. Yet, Meech is getting the full benefits of slinger mechanization with a Motive Sandslinger which rams all of their molds except for squeezer work. *More information may be obtained by writing to Beardsley & Piper, 2424 N. Cicero Ave., Chicago.*

are recorded.

Third malleable iron session, with Prof. Richard W. Heine, University of Wisconsin, as speaker, dealt with **Annealing Problems Related to Melting Irregularities.** Annealing characteristics of white iron are a function of iron chemistry and melting practice, and for best results the latter must be controlled carefully.

Maximum annealability of iron in first and second stage graphitization is obtained under reducing atmospheres in melting. Oxidizing conditions decrease annealability through increasing nitrogen content and decreasing silicon which is accompanied by low nodule count. Normal melting practice should avoid highly oxidizing conditions by limiting free oxygen in the furnace atmosphere to a few tenths of 1 per cent, holding silicon losses to less than 15 per cent, and keeping water vapor content under 6 grains per cu ft.

Prof. Heine prefers a minimum carbon of 2.25 to 2.30 per cent since lower carbons permit oxidation from the furnace atmosphere to occur more readily. With carbon above 2.43 per cent mechanical properties are reduced. Silicon in the range 1.15 to 1.30 per cent appears to be less sensitive to effect of water vapor, makes it easier to keep yield point above the minimum, and provides a safety factor against oxidation. Manganese 0.10 to 0.15 per cent above the Mn/S ratio (2 S + 0.15) does not interfere with graphitization except at the casting skin where pearlite rims are more persistent.

Topic of the concluding session was "Dielectric Core Ovens" and the speaker W. H. Hickock, Girdler Co., Louisville, Ky.

Opening session on steel dealt with **Quality Control in the Melting Department** by B. A. Lawson, Harrison Steel Castings Co., Attica, Ind. It was divided into openhearth and electric furnace practice. In both, with slight differences, control is exercised to obtain a definite chemistry so that only one deoxidation practice is required and best alloy recovery is obtained. This control also results in high physical properties and good castability.

Open-hearth practice was based on examination of 700 heats, and established on a chemistry for grade B steel of 0.25 C, 0.75 Mn, 0.035 max P, 0.045 max S, 0.45 Si, 0.05 max Cr, 0.02 max Mo, 0.10 max Ni, and 0.20 max Cu. Melters are trained to follow definite standards in melting, and maintain written forms containing data on every step during the melt. Progress of the heat is followed by fracture carbons as well as laboratory tests, slag viscosities, etc. Numerous records are kept and include melt-down carbon, temperature readings, temperature drop from tap to pour, slag vicosity, metal fluidity and structure based on etching of ends of test bar fracture.

**Steel Peneration** by Dr. R. C. Emmons, University of Wisconsin, Madison, and Jack Bach, Falk Corp., Milwaukee, was the subject of the second session, and was discussed by Dr. Emmons. The authors presented an interesting theory on this phenomena based on experimental work in the laboratory and in the foundry on some large steel castings. That investigation indicates that penetration occurs in two stages. The primary one is such that the penetrated sand can be removed from the casting without difficulty, but when followed by the second stage, the sand is fused onto the casting. This paper is presented in full elsewhere in this issue.

John B. Caine, Cincinnati, was the speaker at the third session and discussed **Risering for Magnaflux Inspection.** He pointed out that this method of inspection reveals presence of invisible, fine, hairline cracks which show up only on machining. The cracks apparently are hot tears or internal ruptures which, while extremely narrow, may be 3 in. long and penetrate to 1½ in.

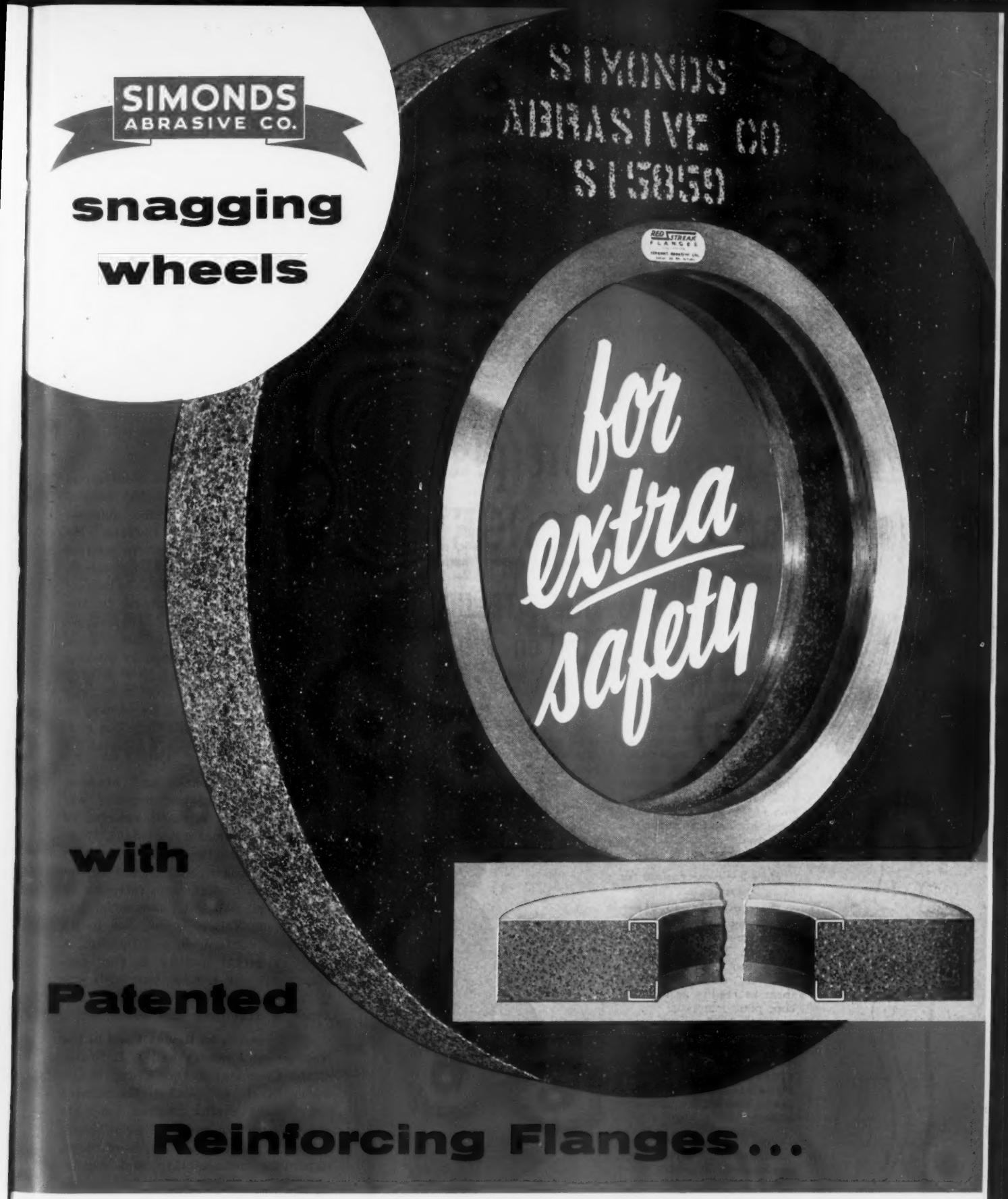
According to the speaker, the usual practice of designing the gating system to create the maximum hot spot to promote directional solidification may be a contributing factor, hot tearing occurring at as little at 25° F below the solidification temperature. Risers should be designed only large enough to feed efficiently. Mr. Caine also said that in displacement of centerline shrinkage by design factors such as junctions of sections, the metal flow across the sand face will cause Magnaflux indications which appear like hot tears. Eroded sand inclusions in the casting may do the same.

Final steel session was a panel discussion on **Cleaning Room Practices.** Constituting the panel were:

At top, left to right: B. Jacobs Jr., Grede Foundries Inc., ticket chairman; B. H. Booth, Carpenter Brothers Inc., chapter treasurer, and C. G. Arps, Allis-Chalmers Mfg. Co. Bottom, left to right: Arthur A. Agostini, Grede Foundries Inc., and P. C. Fuerst, Falk Corp., chapter vice chairman. All of Milwaukee

SIMONDS ABRASIVE CO.

# snagging wheels

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Rugged, high speed resinoid bonded wheels . . . strong enough to take more than double the force usually encountered in grinding under normal conditions of use. Simonds Reinforcing Flanges prevent radial cracks as wheel wears down to stub. Available in wheels of 6″, 10″ and 12″ hole sizes. Send for bulletin ESA 154 "Simonds Red Streak Flanges" and name of your distributor.

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Stanley G. Lipinski, Pelton Steel Casting Co.; Stephen Kline, Crucible Steel Casting Corp.; and Lloyd Olson, Bucyrus-Erie Co., all of Milwaukee. Sizes of castings produced in the three plants vary considerably.

In introduction of the panel, it was pointed out that chipping and grinding of castings sometimes constitutes one-third of cleaning costs. Men responsible for cleaning room operations always are alert for new methods and procedures. Purpose of the panel discussion, therefore, was to provide the participants an opportunity to describe cleaning operations in their respective plants.

First nonferrous session had Donald L. LaVelle, Federated Metals Division, American Smelting & Refining Co., South Plainfield, N. J., as speaker on **Gas and Its Control in Aluminum Casting Alloys.** According to Mr. LaVelle, the only gas with which the aluminum foundryman need be concerned is hydrogen. It results from the reaction of molten metal with water or water vapor. Gas is soluble in molten metal, causing gas porosity or pinholes in the castings. Solubility increases rapidly with increasing temperature and overheating or holding at elevated temperatures are prime causes of excessive porosity.

Hydrogen may be removed by bubbling nitrogen or chlorine through the melt or plunging in tablets of chlorinated hydrocarbons. An excellent means of estimating quantity of gas in a melt or of gaging the effectiveness of degassing procedure is to solidify a small sample in a partial vacuum, which greatly magnifies gas porosity. Presence of gas is not all detrimental since completely degassed aluminum exhibits aggravated shrinkage and is difficult to handle. Aluminum with a small amount of gas will not show pinholes to the eye on machined surfaces, and will have a "normal" shrinkage.

**Melting and Fluxing of Nonferrous Alloys** was discussed at the second session by David Stein, Samuel Greenfield Co. Inc., Buffalo. He pointed out that atmosphere control is important to obtain best combustion and melting conditions. Analysis of the furnace atmosphere is the most accurate method to determine the condition, but reasonably good estimates may be obtained by placing a small piece of clean zinc in the flame for a few minutes. Reducing conditions are indicated by carbon or soot deposits, neutral by a clean surface, and oxidizing by a whitish or yellowish white deposit.

With ingot bronzes and brasses, fluxes usually are not required except for use of a small amount of phosphor-copper as a deoxidant. Magnesium and aluminum alloys tend to pick up hydrogen, and should be degassed with dry gaseous nitrogen or chlorine, or pelleted chlorinated hydrocarbons. Yellow brass, due to its high zinc content, is self-fluxing. A gage of metal quality is the suggested ¾ x 3 x 6-in. bar with one ¾ x 6-in. edge cast against a chill which is fractured and examined.

Third session on **Resins Used in the Nonferrous Foundry** had J. L. Stark, Allied Chemical & Dye Corp., Edgewater, N. J., as speaker. He pointed out that resins baked quickly saved on driers and core oven space. They migrate to the surface of cores, improving collapsibility and permeability. Due to the latter, finer sands may be used, and since low amounts of resins are used as binder, the organic content is low. Mr. Stark discussed briefly the urea, phenolic and alkyd type resins and their applications. He believes that alkyd resins would have increasing use in cores as they combine the properties of oils and plastics or resins.


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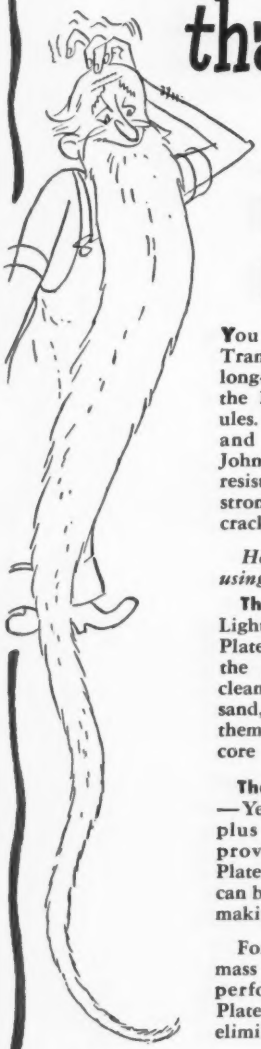

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Concluding session consisted of a panel discussion on foundry problems, with Donald L. LaVelle, David Stein and Dallac Amburn, Allied Chemical & Dye Corp., New York, as members and M. E. Nevins, Wisconsin Centrifugal Casting Foundry Inc., Waukesha, Wis., as moderator. Subjects discussed related to gases in metals and alloys, shell molding progress in the industry, use of borax and glass covers, silicon pick-up from crucibles, and pouring temperatures.

With regard to shell molding, opinion was that it is increasing in application. Use of borax and glass as covers was opposed in that they tend to carry a small amount of moisture which is released at melting temperature to enter the metal. Doubt was expressed that silicon is picked up from silicon carbide crucibles used for melting copper-base alloys with a high lead content.

Prof. P. C. Rosenthal, University of Wisconsin, speaking on **The Significance of Physical Testing of Gray Iron** in the first gray iron session compared the results of tests on gray and nodular iron, stating that much of the work was done in connection with the revision of the AFS *Cast Metals Handbook*. He pointed out that the three main reasons for physical testing are: Proof that material meets both customer and plant specifications, development of new material, and obtaining data for product design.

Prof. Rosenthal said that graphite size and distribution can be deduced from the tensile strength of gray iron. This in turn will determine the machinability and, to a certain extent, the creep or growth at high temperatures.

The speaker also discussed nodular iron and said that its microstructure will be indicated by the yield strength. He also mentioned that this point is used in design for static stresses, whereas the ultimate strength is used for cyclic stresses in conjunction with the endurance ratio. Conversely, tensile strength and elongation can be predicted within a narrow range from the brinell hardness for nodular iron.

O. Jay Myers, Archer-Daniels-Midland Co., stressed some of the common misconceptions in his talk, **Core Sand Practice—Fact or Fiction** at the second gray iron session. Mr. Myers, who is also chairman of the AFS Sand Division, pointed out that on the basis of tests made by the sub-committee on core sands, oil in a well mixed core sand will not settle out prior to or during baking. He also said that tests have shown there is no appreciable segregation

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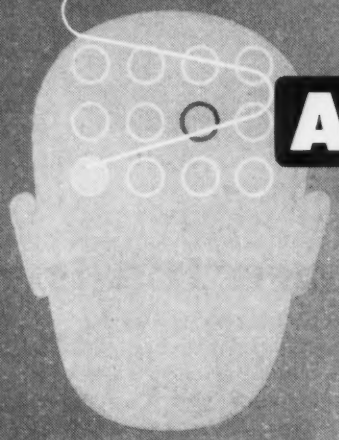

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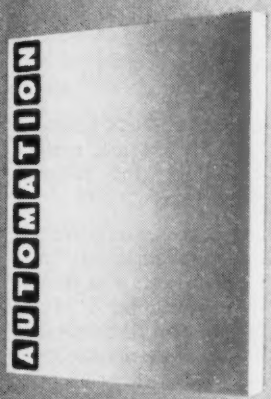


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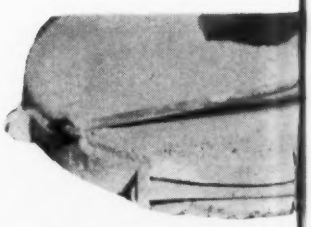

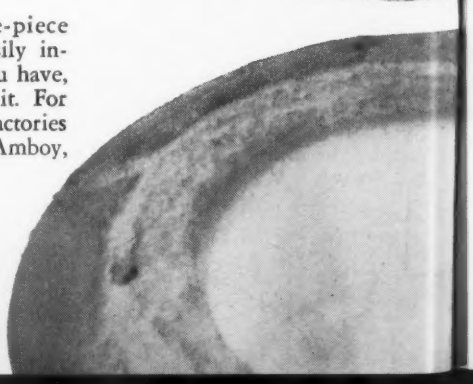

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of the base core sand during the blowing operation. His talk was in the form of a true-false quiz handed out at the beginning of the session.

**Carbon Linings for Cupolas** was the subject which T. J. Wilde, National Carbon Co., New York, discussed at the third gray iron session. Conditions in the cupola are not too unlike those in the blast furnace, he said, and since carbon linings have given excellent service in blast furnaces their use in cupolas should reduce repairs.

In cupolas, carbon blocks are installed in the well and trough, with the blocks laid against the shell, which is cooled by water spray. A closed water cooling system also can be used, or cooling can be dispensed with if firebrick is placed between the carbon blocks and the shell. It is usual for the melting zone to be unlined but water cooled.

Mr. Wilde said a carbon-lined cupola can go 5 to 6 days at 16 to 18 hrs a day without dropping bottom, and as long as 18 days continuous operation is known. Carbon is a neutral lining material, thus it provides more flexibility in slags, and variations in charges.

Work is under way on procedure to place thin carbon linings in the melting zone in addition to water cooling. This necessitates putting ribs in the shell to hold the blocks. Answering a question, the speaker stated that initial cost of installing a carbon lining is approximately double that of the usual acid refractory lining.

Frank S. Brewster, South Gate Aluminum & Magnesium Co., South Gate, Calif., gave **A Review of Sand Bonding Processes** at the concluding gray iron session. He discussed characteristics of the shell and D molding processes. One of the advantages of the D process is that the sand mixture can be used as a facing material on core sand molds. Standard patterns are used and the molds are baked by radiant heaters or in an oven. Heap sand also can be used as a backing material. A surface finish of 150 microinches can be produced on castings poured in such molds.

**Sealing Metal Coreboxes Against Blow-by,** first subject covered at the four pattern sessions, was presented by Richard Olson, Dike-O-Seal Inc., Chicago. He described a method of applying a Buna-N rubber seal at the parting line of flat or contoured coreboxes and to loose pieces in a box to prevent passage of air and sand. Consequently corebox wear at the parting line is minimized. Cores have uniform permeability and no fins.

Other advantages of the seal listed by Mr. Olson are absence of rat-tail-


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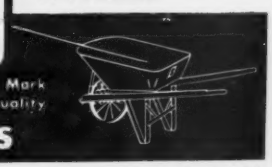

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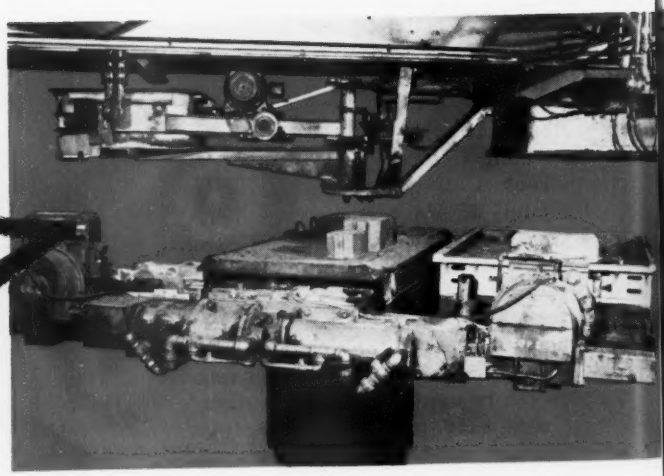

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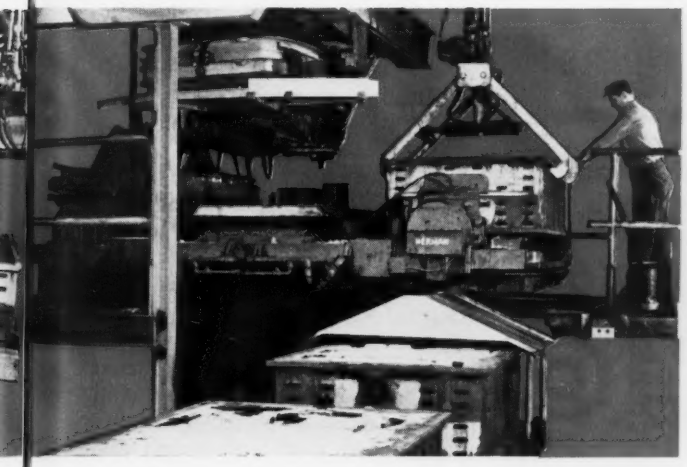

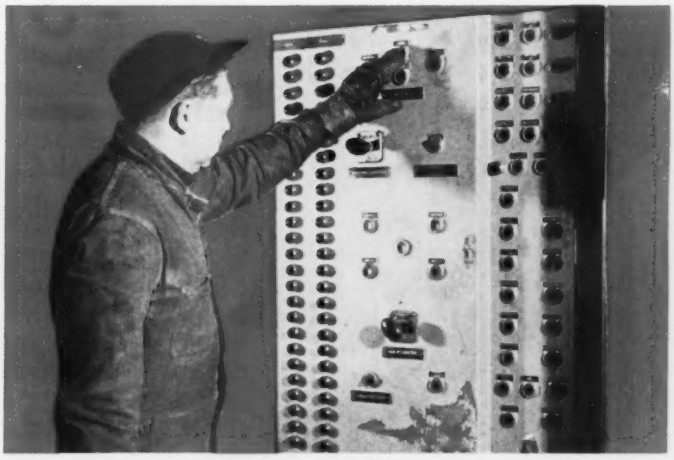

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ing in cores, less hazard to workers from flying sand, use of lower core-box clamping pressure, lighter boxes and the fact that blow-in driers can be used. He also said that the seal is effective even though the two halves of the box are not closed tightly. The seal also is effective for mold-blowing operations.

James M. Barrabee, International Harvester Co., Chicago, discussed **Quality Control in a Pattern Shop** at the second pattern session. In his opinion, the first step in production of quality patterns is to furnish the patternmaker with good, clear drawings. Most blueprints are too complicated; they contain too many dimensions. Engineering blueprints should be redrawn and simplified for use by patternmakers.

A single base point should be used in all dimensioning, and the dimensions should include the shrink factor so that patternmakers do not have to compute shrinkage as they work.

Records should be kept of all pattern changes, locating points, type of chaplets used, location in storage and types of casting defects encountered in production. To facilitate inspection and the making of engineering changes, patterns and coreboxes should be sent back to the pattern shop after a production run before being put in storage.

The third pattern session featured a talk on **Good Pattern Casting Practices** by A. F. Pfeiffer, Allis-Chalmers Mfg. Co., Milwaukee. He contended that, to produce quality work, a patternmaker must be interested in the job from the pattern to the casting. He also advocated the use of scale models to aid in planning patterns, coreboxes and related equipment.

Casting quality depends largely on the pattern equipment, therefore cost should not be spared in getting good patterns. Mr. Pfeiffer went on to discuss proper pattern construction, methods of marking patterns and showed slide pictures to illustrate his points.

T. E. Barlow, Eastern Clay Products Department, Chicago, concluded the pattern sessions with a talk on **Pattern Equipment for High Pressure Molding.** He said that patterns used for this type of molding can be of lightweight construction. Patterns must be precise because details will be produced exactly. Furthermore, the casting produced is identical in size to the pattern. In general, application of good pattern practice and good workmanship are required.

Ordinarily matchplate patterns should not be used, although they have performed well in one or two instances. However, the same effect can be achieved by using locating pins to align pattern plates on the molding machine platen.

Speaker at the first luncheon was Arthur A. Agostini, Grede Foundries Inc., Milwaukee. He spoke on the free enterprise system, saying that one of its basic precepts is that individuals must accept the responsibility for controlling their government and keeping themselves free. Title of his talk was **Common Sense for a Common Good.**

C. G. Arps, Allis-Chalmers Mfg. Co., Milwaukee, spoke at the banquet. His topic, **Are Your Books Balanced,** dealt with employer-employee relations. He maintained that people are the most valuable asset of any business. Personnel policies should protect the rights of individuals and consider their social and economic needs. Industry should exist for the individual.

H. E. Goodnough, sales promotion manager, Milwaukee Braves, addressed the Friday luncheon group on **Baseball, a Fulfillment of our American Dream.**


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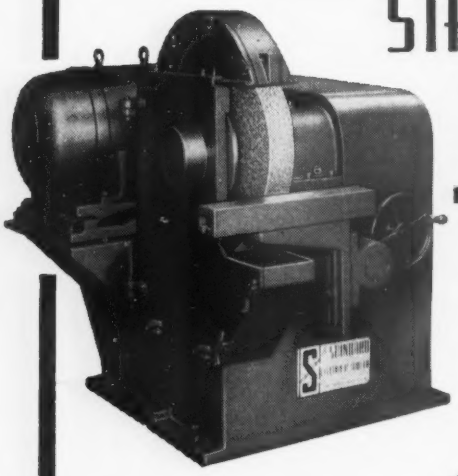

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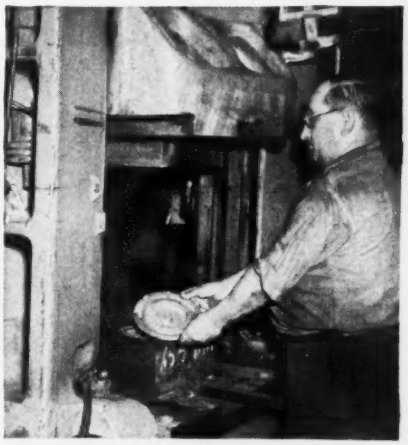
(*Above and right*) *Cecostamp straightening malleable iron castings at large foundry. Board drop hammer was formerly used for this work, requiring stoppage for adjustments and stroke set-up. Cecostamp permits almost continuous operation.*



(*Above*) *Coining malleable iron castings on Cecostamp. Faster production and greater accuracy than on strap hammer formerly used.*

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***...practically eliminate rejects***
***...reduce maintenance costs***
***...lessen operator fatigue***

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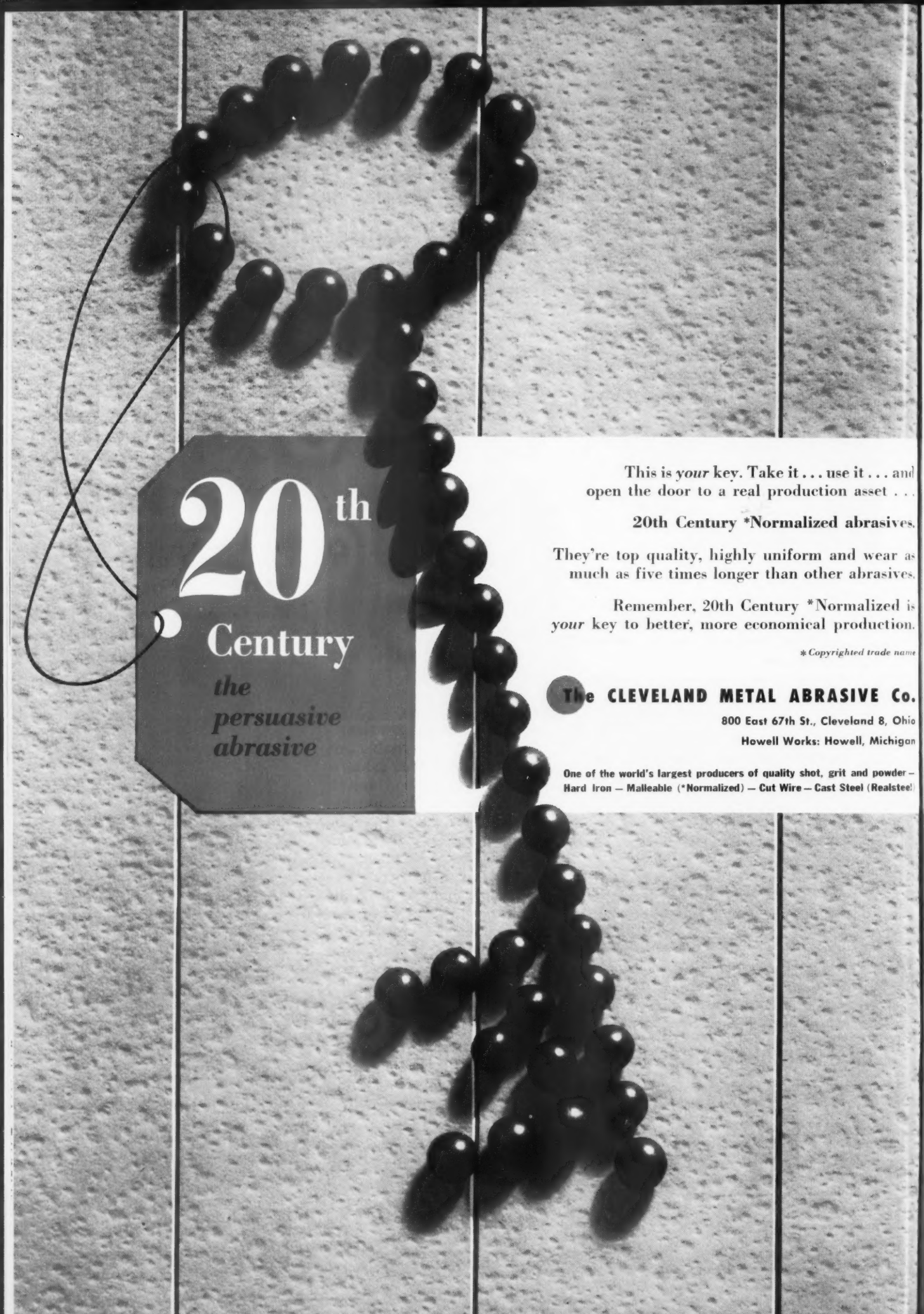
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One of the world's largest producers of quality shot, grit and powder — Hard Iron — Malleable (*Normalized) — Cut Wire — Cast Steel (Realsteel)

# FOUNDRY STATISTICS

## MALLEABLE IRON

(Shipments of castings—net tons[1])

| | Shipments | | Unfilled Orders[2] |
|---|---|---|---|
| | Total | For Sale | |
| 1952 | 926,120 | 573,472 | ..... |
| 1953 | | | |
| Dec. | 72,399 | 39,721 | 95,612 |
| Total | 970,506 | 578,749 | ..... |
| 1954 | | | |
| Jan. | 70,288 | 38,266 | 85,565 |
| Feb. | 69,078 | 37,792 | 81,579 |
| Mar. | 84,342 | 47,125 | 74,219 |
| Apr. | 74,515 | 39,102 | 69,094 |
| May | 67,856 | 37,306 | 67,040 |
| June | 72,820 | 41,121 | 60,163 |
| July | 50,893 | 25,243 | 63,711 |
| Aug. | 59,259 | 34,528 | 62,494 |
| Sept. | 58,015 | 33,929 | 66,742 |
| Oct. | 64,321 | 36,956 | 71,090 |
| Nov. | 70,030 | 41,609 | 80,686 |
| Dec. | 87,934 | 49,005 | 85,064 |
| Total | 819,351 | 461,982 | ..... |

## ALUMINUM

(Shipments of castings—1000 pounds)

| | Shipments | | | | Unfilled Orders[2] |
|---|---|---|---|---|---|
| | Total | Sand | Perm. Mold | Die | |
| 1952 | 518,979 | 194,616 | 146,883 | 169,732 | ..... |
| 1953 | | | | | |
| Dec. | 51,571 | 15,265 | 16,907 | 18,963 | 105,980 |
| Total | 658,022 | 214,553 | 200,025 | 239,330 | ..... |
| 1954 | | | | | |
| Jan. | 51,446 | 14,698 | 16,615 | 19,709 | 103,318 |
| Feb. | 51,213 | 14,696 | 17,281 | 18,754 | 96,011 |
| Mar. | 56,184 | 14,468 | 19,576 | 21,645 | 93,407 |
| Apr. | 53,006 | 14,073 | 18,091 | 20,366 | 91,853 |
| May | 47,663 | 12,461 | 16,312 | 18,368 | 83,848 |
| June | 48,061 | 12,442 | 17,105 | 17,886 | 79,126 |
| July | 39,636 | 11,299 | 13,749 | 14,004 | 76,513 |
| Aug. | 42,429 | 11,252 | 15,335 | 15,213 | 76,684 |
| Sept. | 46,249 | 10,717 | 16,641 | 18,228 | 79,873 |
| Oct. | 53,901 | 12,765 | 19,238 | 21,245 | 88,518 |
| Nov. | 55,224 | 12,934 | 20,396 | 21,296 | 94,491 |
| Dec. | 62,752 | 13,753 | 23,629 | 24,724 | 99,556 |
| Total | 607,764 | 155,558 | 213,968 | 231,438 | ..... |

## COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

| | Shipments | | | Unfilled Orders[2] |
|---|---|---|---|---|
| | Total | Sand | Perm. Mold | |
| 1952 | 1,009,910 | 910,862 | 63,865 | ..... |
| 1953 | | | | |
| Dec. | 77,675 | 68,821 | 5,082 | 48,421 |
| Total | 990,496 | 888,369 | 61,316 | ..... |
| 1954 | | | | |
| Jan. | 71,437 | 63,034 | 4,618 | 42,351 |
| Feb. | 68,849 | 60,913 | 4,743 | 21,943 |
| Mar. | 76,480 | 67,952 | 5,123 | 38,417 |
| Apr. | 72,900 | 65,418 | 4,732 | 34,111 |
| May | 67,859 | 61,469 | 3,755 | 31,568 |
| June | 70,777 | 64,328 | 3,567 | 30,743 |
| July | 56,380 | 51,070 | 3,073 | 30,872 |
| Aug. | 68,891 | 63,389 | 3,547 | 28,883 |
| Sept. | 68,267 | 62,152 | 3,637 | 31,087 |
| Oct. | 70,276 | 63,855 | 3,619 | 30,296 |
| Nov. | 70,020 | 63,065 | 4,089 | 27,508 |
| Dec. | 72,421 | 65,159 | 4,346 | 31,954 |
| Total | 834,557 | 751,804 | 48,849 | ..... |

## MAGNESIUM

(Shipments of castings—1000 pounds[1])

| | Shipments | | Unfilled Orders[2] |
|---|---|---|---|
| | Total | For Sale | |
| 1952 | 34,857 | 32,977 | ..... |
| 1953 | | | |
| Dec. | 2,691 | 2,434 | 9,313 |
| Total | 34,517 | 31,469 | ..... |
| 1954 | | | |
| Jan. | 2,451 | 2,149 | 8,800 |
| Feb. | 2,194 | 1,945 | 8,315 |
| Mar. | 2,407 | 2,109 | 7,698 |
| Apr. | 2,068 | 1,857 | 7,358 |
| May | 1,738 | 1,541 | 7,522 |
| June | 2,034 | 1,820 | 8,296 |
| July | 1,924 | 1,712 | 8,073 |
| Aug. | 2,157 | 1,944 | 7,795 |
| Sept. | 2,059 | 1,855 | 7,474 |
| Oct. | 2,092 | 1,876 | 7,294 |
| Nov. | 2,161 | 1,906 | 6,867 |
| Dec. | 2,287 | 2,031 | 6,678 |
| Total | 25,572 | 22,745 | ..... |

## PRODUCTION WORKERS

### Estimated Number

(Thousands)

| | Nov. 1954 | Oct. 1954 | Nov. 1953 |
|---|---|---|---|
| Ferrous | 187,000 | 184,500 | 203,600 |
| Nonferrous | 63,500 | 60,600 | 72,400 |

### Average Weekly Earnings

| | | | |
|---|---|---|---|
| Gray Iron | 75.83 | 75.05 | 73.47 |
| Malleable Iron | 77.61 | 77.02 | 71.63 |
| Steel | 75.20 | 76.00 | 76.63 |
| Nonferrous | 84.24 | 84.25 | 80.00 |

### Average Weekly Hours

| | | | |
|---|---|---|---|
| Gray Iron | 39.7 | 39.5 | 39.5 |
| Malleable Iron | 39.8 | 39.7 | 37.9 |
| Steel | 37.6 | 38.0 | 38.7 |
| Nonferrous | 40.5 | 40.9 | 40.0 |

### Labor Turnover Rate (November)

(Per 100 employees)

| | Total Accession | Total Separation | Quit | Layoff |
|---|---|---|---|---|
| Gray Iron | 4.2 | 2.3 | 0.8 | 1.2 |
| Malleable Iron | 5.4 | 2.1 | 1.0 | 0.6 |
| Steel | 2.0 | 4.2 | 0.7 | 3.2 |
| Nonferrous | 7.1 | 2.9 | 0.9 | 1.6 |

Source: Bureau of Labor Statistics

## GRAY IRON CASTINGS—SHIPMENTS

(Net tons[1])

| | All Castings | | Miscellaneous Castings | | Heavy Steel Ingot Molds | | Chilled Railroad Car Wheels | Pressure Pipe & Fittings | Soil Pipe & Fittings | Unfilled Orders[2] |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | For Sale | Total | For Sale | Total | For Sale | Total | Total[3] | Total[3] | |
| 1952 | 12,869,464 | 7,371,700 | 8,122,274 | 3,792,567 | 2,238,309 | 1,070,252 | 544,896 | 1,312,518 | 651,467 | ..... |
| 1953 | | | | | | | | | | |
| Dec. | 1,036,932 | 558,204 | 636,747 | 277,852 | 229,720 | 109,887 | 30,011 | 94,707 | 45,747 | 954,885 |
| Total | 13,707,902 | 7,494,843 | 8,449,837 | 3,675,454 | 2,829,159 | 1,389,483 | 467,142 | 1,285,598 | 677,166 | ..... |
| 1954 | | | | | | | | | | |
| Jan. | 932,298 | 488,497 | 607,755 | 261,164 | 154,359 | 60,947 | 31,316 | 90,898 | 47,970 | 871,918 |
| Feb. | 936,364 | 491,983 | 607,085 | 252,591 | 156,933 | 70,261 | 29,240 | 92,546 | 50,560 | 865,344 |
| Mar. | 1,046,779 | 553,358 | 684,272 | 282,328 | 153,366 | 65,950 | 34,240 | 113,016 | 61,895 | 842,499 |
| Apr. | 995,052 | 528,027 | 657,126 | 263,147 | 126,083 | 56,114 | 29,075 | 116,420 | 66,348 | 826,491 |
| May | 943,335 | 516,475 | 605,385 | 247,623 | 122,839 | 57,106 | 27,144 | 122,514 | 65,453 | 775,278 |
| June | 986,810 | 556,047 | 616,317 | 261,133 | 141,712 | 70,060 | 30,883 | 130,503 | 67,395 | 803,570 |
| July | 821,151 | 449,621 | 510,173 | 209,294 | 131,180 | 62,681 | 22,902 | 98,810 | 59,086 | 828,924 |
| Aug. | 934,644 | 541,904 | 569,790 | 250,702 | 140,165 | 69,897 | 29,134 | 127,255 | 68,300 | 829,505 |
| Sept. | 921,232 | 533,909 | 559,934 | 248,124 | 139,679 | 68,053 | 25,374 | 124,821 | 71,424 | 810,654 |
| Oct. | 942,934 | 552,022 | 570,365 | 253,802 | 150,282 | 79,191 | 23,599 | 130,326 | 68,362 | 789,117 |
| Nov. | 997,301 | 547,447 | 623,390 | 258,933 | 167,983 | 85,703 | 25,723 | 118,480 | 61,725 | 759,613 |
| Dec. | 1,074,258 | 563,699 | 680,700 | 276,045 | 200,044 | 97,936 | 27,229 | 111,082 | 55,203 | 744,633 |
| Total | 11,532,158 | 6,322,989 | 7,292,292 | 3,064,886 | 1,784,625 | 843,899 | 325,859 | 1,376,671 | 743,721 | ..... |

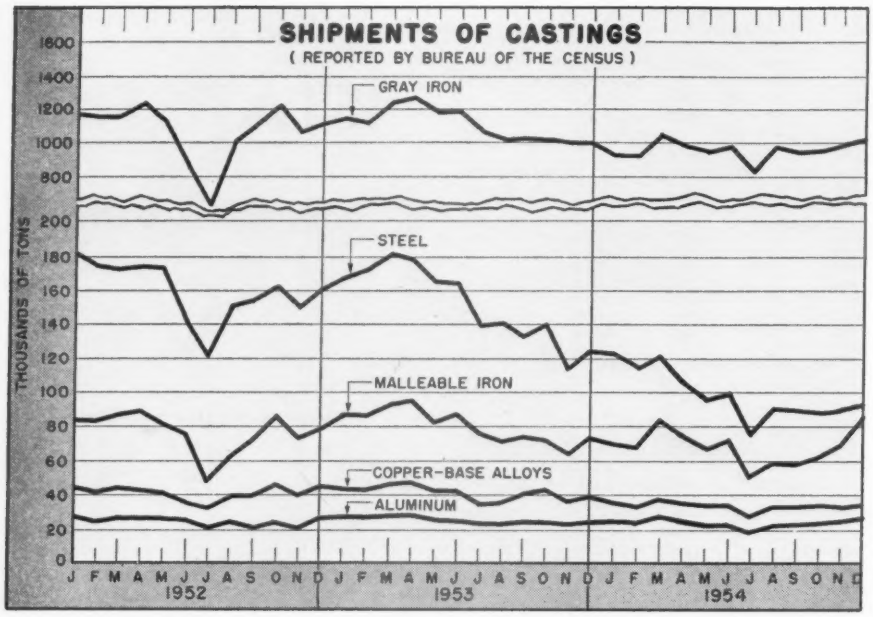
## STEEL CASTINGS—SHIPMENTS

(Net tons[1])

| | All Castings | | | Carbon | | | Alloy Steel | | | Unfilled Orders[2] |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | For Sale | Railway Specialties | Total | For Sale | Railway Specialties | Total | For Sale[4] | Railway Specialties | |
| 1952 | 1,927,942 | 1,476,242 | 339,561 | 1,375,233 | 1,076,285 | 298,948 | 552,709 | 389,816 | 40,613 | ..... |
| 1953 | | | | | | | | | | |
| Dec. | 123,295 | 92,299 | 18,665 | 85,607 | 68,617 | 16,990 | 37,688 | 29,912 | 1,675 | 278,389 |
| Total | 1,834,197 | 1,400,013 | 321,010 | 1,276,729 | 983,238 | 293,491 | 557,468 | 417,148 | 27,519 | ..... |
| 1954 | | | | | | | | | | |
| Jan. | 122,758 | 93,577 | 20,197 | 83,927 | 62,749 | 18,407 | 38,831 | 30,828 | 1,790 | 251,847 |
| Feb. | 116,520 | 88,699 | 17,938 | 81,433 | 60,638 | 15,961 | 35,087 | 28,061 | 1,967 | 234,634 |
| Mar. | 122,310 | 92,271 | 15,684 | 85,211 | 62,955 | 14,190 | 37,099 | 29,316 | 1,494 | 214,367 |
| Apr. | 105,788 | 78,754 | 11,031 | 72,118 | 52,389 | 9,538 | 33,670 | 26,365 | 1,493 | 197,857 |
| May | 94,610 | 70,596 | 9,454 | 64,546 | 46,651 | 8,342 | 30,064 | 23,945 | 1,112 | 182,502 |
| June | 100,022 | 72,881 | 8,639 | 69,021 | 48,327 | 7,552 | 31,001 | 24,554 | 1,087 | 169,594 |
| July | 75,848 | 53,207 | 5,815 | 50,453 | 33,461 | 4,964 | 25,125 | 19,746 | 851 | 170,567 |
| Aug. | 89,590 | 66,792 | 9,844 | 61,344 | 44,236 | 8,148 | 28,256 | 21,360 | 1,196 | 168,303 |
| Sept. | 88,359 | 64,722 | 8,668 | 59,039 | 41,735 | 7,690 | 29,320 | 22,009 | 978 | 158,823 |
| Oct. | 87,085 | 64,004 | 8,580 | 56,705 | 39,872 | 7,596 | 30,380 | 23,148 | 984 | 154,079 |
| Nov. | 87,659 | 64,812 | 7,742 | 56,057 | 40,057 | 6,624 | 31,602 | 23,609 | 1,118 | 175,715 |
| Dec. | 93,547 | 69,843 | 11,714 | 62,967 | 46,632 | 6,624 | 30,580 | 22,966 | 1,245 | 179,148 |
| Total | 1,184,096 | 880,158 | 134,806 | 802,821 | 579,702 | 115,636 | 381,015 | 295,907 | 15,315 | ..... |

[1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale. [4]Railway specialties not included.

## FOUNDRY STATISTICS




## COMMERCIAL HEAT TREATING

(National Billings of Metal Institute Members)

| | 1952 | | 1953 | | 1954 | |
|---|---|---|---|---|---|---|
| | No. Reporting | Total Reported | No. Reporting | Total Reported | No. Reporting | Total Reported |
| July | 56 | $2,253,346 | 58 | $2,522,651 | 61 | $1,722,449 |
| Aug. | 57 | 2,287,135 | 60 | 2,452,186 | 62 | 1,801,659 |
| Sept. | 57 | 2,498,544 | 57 | 2,522,127 | 64 | 1,853,665 |
| Oct. | 57 | 2,837,574 | 59 | 2,782,219 | 62 | 1,916,504 |
| Nov. | 53 | 2,321,932 | 59 | 2,493,497 | 60 | 1,966,333 |
| Dec. | 52 | 2,431,975 | 57 | 2,219,406 | 62 | 2,099,847 |
| Annual total | | 30,875,924 | | 31,733,067 | | 24,244,368 |

## ZINC-BASE ALLOY

(Shipments of castings—1000 pounds[1])

| | Shipments | | Unfilled Orders[2] |
|---|---|---|---|
| | Total | For Sale | |
| 1952 | 408,353 | 282,673 | ..... |
| 1953 | | | |
| Dec. | 38,661 | 27,348 | 64,105 |
| Total | 521,253 | 349,022 | ..... |
| 1954 | | | |
| Feb. | 37,660 | 24,112 | 55,351 |
| Mar. | 42,991 | 28,828 | 52,544 |
| Apr. | 38,968 | 25,211 | 51,388 |
| May | 36,793 | 23,671 | 46,726 |
| June | 40,708 | 26,890 | 47,537 |
| July | 28,306 | 18,605 | 43,231 |
| Aug. | 34,639 | 24,898 | 46,288 |
| Sept. | 36,594 | 25,617 | 56,006 |
| Oct. | 39,072 | 27,337 | 64,500 |
| Nov. | 48,437 | 35,207 | 62,750 |
| Dec. | 50,177 | 35,211 | 69,403 |
| Total | 434,345 | 295,587 | 595,724 |

## INDEX OF FOUNDRY EQUIPMENT ORDERS

Foundry Trades Only

(Net Orders Closed, New Equipment)

| | 1953 | 1954 |
|---|---|---|
| Jan. | 99.6 | 173.8 |
| Feb. | 97.5 | 99.9 |
| Mar. | 132.2 | 82.7 |
| Apr. | 111.8 | 125.3 |
| May | 182.7 | 80.8 |
| June | 156.8 | 86.4 |
| July | 159.2 | 68.8 |
| Aug. | 236.3 | 75.6 |
| Sept. | 127.7 | 68.3 |
| Oct. | 87.2 | 147.5 |
| Nov. | 150.0 | 61.4 |
| Dec. | 161.2 | 113.9 |

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent (monthly average). This is a new base period. Source: Foundry Equipment Manufacturers Association.

## COKE PRODUCTION & CONSUMPTION

(Net tons)

| | Production | Consumption Total | Consumption By Foundries |
|---|---|---|---|
| 1952 | 68,254,109 | 67,865,639 | 3,102,446 |
| 1953 | | | |
| Dec. | 6,093,009 | 6,041,383 | 210,388 |
| Total | 78,467,806 | 78,227,414 | 2,915,420 |
| 1954 | | | |
| Jan. | 5,812,426 | 5,639,117 | 224,298 |
| Feb. | 4,889,717 | 4,920,651 | 211,114 |
| Mar. | 5,146,189 | 5,177,765 | 228,139 |
| Apr. | 4,693,036 | 4,569,843 | 212,272 |
| May | 4,802,245 | 4,656,950 | 204,958 |
| June | 4,640,064 | 4,683,726 | 194,664 |
| July | 4,618,665 | 4,555,701 | 170,617 |
| Aug. | 4,510,603 | 4,501,477 | 195,344 |
| Sept. | 4,490,603 | 4,434,650 | 191,607 |
| Oct. | 5,082,374 | 5,100,135 | 208,418 |
| Nov. | 5,230,237 | 5,283,916 | 221,391 |
| Dec. | 5,610,564 | 5,615,228 | 217,104 |
| Total | 59,526,723 | 59,139,159 | 2,479,926 |

## INGOT BRASS & BRONZE

(Shipments in net tons)

| | 1954 | 1955 |
|---|---|---|
| Jan. | 20,661 | 25,201 |
| Feb. | 19,920 | ..... |
| Mar. | 23,653 | ..... |
| Apr. | 24,746 | ..... |
| May | 22,269 | ..... |
| June | 22,348 | ..... |
| July | 17,074 | ..... |
| Aug. | 21,684 | ..... |
| Sept. | 22,464 | ..... |
| Oct. | 24,080 | ..... |
| Nov. | 23,061 | ..... |
| Dec. | 21,273 | ..... |
| Total for year | 263,233 | 25,201 |

## IRON AND STEEL SCRAP CONSUMPTION

(Gross tons*)

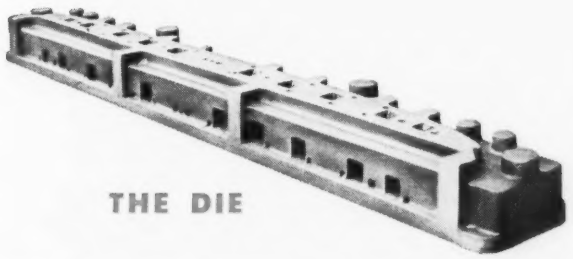
| | All Scrap Total | By Types of Furnace: Cupola Total | Air Total | Electric Total |
|---|---|---|---|---|
| 1952 | 61,625,549 | 9,154,146 | 1,053,233 | 8,015,064 |
| 1953 | | | | |
| Nov. | 5,064,565 | 687,498 | 60,200 | 477,666 |
| 11 mo. | 64,335,699 | 8,921,187 | 858,332 | 7,736,214 |
| Dec. | 4,690,277 | 755,276 | 68,002 | 442,818 |
| Total | 69,005,976 | 9,676,463 | 1,026,334 | 8,263,880 |
| 1954 | | | | |
| Jan. | 4,574,384 | 711,335 | 71,202 | 505,536 |
| Feb. | 4,385,340 | 704,535 | 67,263 | 462,095 |
| Mar. | 4,637,573 | 783,529 | 82,337 | 517,702 |
| Apr. | 4,582,862 | 748,766 | 79,183 | 518,048 |
| May | 4,776,603 | 710,159 | 67,368 | 506,582 |
| June | 4,664,561 | 725,910 | 75,306 | 515,019 |
| July | 3,909,336 | 565,275 | 45,920 | 420,564 |
| Aug. | 4,164,703 | 671,631 | 65,336 | 486,596 |
| Sept. | 4,298,495 | 675,593 | 68,860 | 500,349 |
| Oct. | 4,782,488 | 710,127 | 67,678 | 528,432 |
| Nov. | 4,928,850 | 737,286 | 71,844 | 573,298 |
| 11 mo. | 49,705,195 | 7,744,146 | 762,297 | 5,534,221 |

## PIG IRON PRODUCTION AND CONSUMPTION

| | Production** (standard grades—net tons) | | | | | Consumption* (By type of furnace—gross tons) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Foundry | Malleable | Basic | Low Phos. Intermediate Low Phos. & Bessemer | Total | Cupola | Air | Electric |
| 1952 | 61,306,723 | 2,864,722 | 3,013,267 | 48,253,390 | 7,175,344 | 61,550,961 | 5,438,294 | 449,646 | 118,820 |
| 1953 | | | | | | 5,091,786 | 374,838 | 18,596 | 12,561 |
| Dec. | 5,712,937 | 172,283 | 276,432 | 4,625,524 | 638,698 | | | | |
| Total | 74,879,511 | 2,599,307 | 3,736,431 | 60,465,016 | 8,347,825 | 66,637,364 | 4,918,480 | 272,311 | 164,267 |
| 1954 | | | | | | | | | |
| Jan. | 5,531,137 | 184,629 | 294,691 | 4,510,870 | 540,947 | 4,933,282 | 362,576 | 17,620 | 14,578 |
| Feb. | 4,764,613 | 156,178 | 272,707 | 3,911,670 | 424,058 | 4,293,942 | 351,824 | 17,257 | 9,892 |
| Mar. | 4,907,147 | 213,249 | 243,356 | 3,977,137 | 473,405 | 4,367,814 | 390,929 | 21,369 | 13,112 |
| Apr. | 4,449,289 | 155,249 | 256,662 | 3,630,901 | 406,477 | 4,021,957 | 375,045 | 26,553 | 10,497 |
| May | 4,572,252 | 154,768 | 231,479 | 3,741,671 | 444,334 | 4,188,269 | 367,437 | 16,453 | 16,531 |
| June | 4,683,629 | 175,759 | 200,154 | 3,853,444 | 454,272 | 4,297,531 | 375,601 | 18,545 | 14,196 |
| July | 4,590,076 | 182,130 | 182,527 | 3,790,999 | 434,420 | 3,990,431 | 293,926 | 12,258 | 13,317 |
| Aug. | 4,529,291 | 186,097 | 165,891 | 3,722,094 | 455,209 | 4,013,552 | 354,067 | 15,926 | 10,325 |
| Sept. | 4,417,888 | 188,599 | 179,629 | 3,622,799 | 426,861 | 4,005,578 | 346,698 | 16,984 | 11,654 |
| Oct. | 4,937,436 | 212,237 | 248,643 | 3,979,437 | 497,119 | 4,518,770 | 367,063 | 16,186 | 11,307 |
| Nov. | 5,204,446 | 202,824 | 263,484 | 4,233,253 | 504,885 | 4,704,215 | 375,526 | 16,178 | 15,932 |
| Dec. | 5,526,720 | 229,717 | 259,423 | 4,510,772 | 526,808 | ..... | ..... | ..... | ..... |
| Total | 58,113,924 | 2,241,436 | 2,798,646 | 47,485,047 | 5,587,465 | ..... | ..... | ..... | ..... |

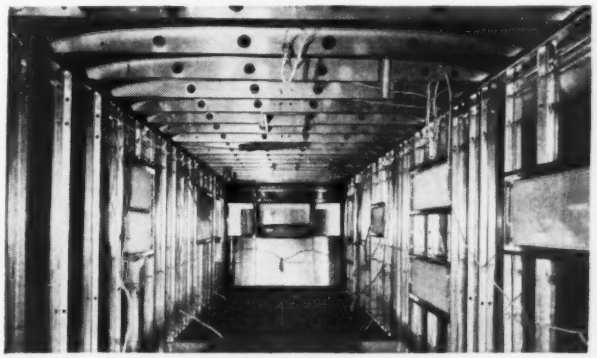
*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only.

# AT NEMCO FOUNDRY: ANOTHER PROBLEM SOLVED BY CITIES SERVICE CORE OIL



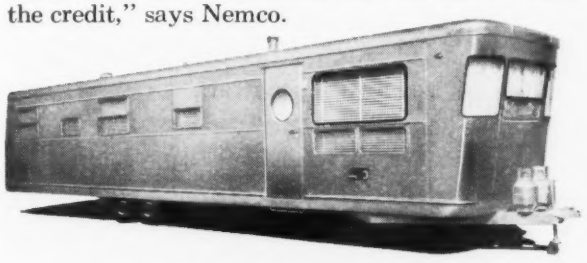
THE DIE

The die pictured here was cast at Nemco Foundry for use by the Spartan Aircraft Company in producing roof ribs for its Spartan Mobile Home. Difficult to produce, it required 10 cores 2⅝″ x 2⅝″ square and 25 cores, quarter-circle in shape, from ¾″ to 1″ in diameter. Semi-circular shape was necessary to core curved slots from top of die to sides. Holes had to be clean and free from obstruction, allowing stamped slugs to fall through. Nemco relied on Cities Service Delco Core Oil to help meet exact specifications. "A smart choice," says J. A. Dean, General Manager. "Delco Core Oil made the job far easier."



THE ROOF RIBS

The roof ribs of this Spartan trailer, cast from the die produced at Nemco, are visual proof of a job well done. "The great strength and high collapsibility of Cities Service Delco Core Oil share a lot of the credit," says Nemco.



THE FINISHED PRODUCT

The finished product is this handsome Spartan Mobile Home awaiting shipment to consumer. Spartan's rigid specifications help make it one of the safest and best on the market.

**Difficult casting of die to form roof ribs for Spartan Mobile Home made easier by Cities Service Delco #36**

Located in Tulsa, Oklahoma, Nemco Foundry enjoys attacking the really tough jobs and making them easier. And often helping to spearhead the attack is Cities Service, as described here by J. A. Dean, General Manager:

"Recently Cities Service Delco #36 Core Oil again solved a tough job for us in fulfilling the requirements for a casting for the Spartan Aircraft Company, makers of Spartan Mobile Homes. The casting was a bottom shoe for blanking die to make roof ribs for the all-aluminum shells for Spartan trailers.

"The die was of Nemcoloy, Type AL, an alloyed grey iron. It was 106″ long, 8″ thick and 13½″ wide, and weighed 2,018 lbs. cleaned.

"It required 10 cores 2⅝″ x 2⅝″ square. In addition, it demanded 25 cores, quarter-circle in shape, ranging from ¾″ to 1″ in diameter. Semi-circular design was necessary in order to core curved slots from the top of the die to the sides of the die. Holes had to be clean and free of obstructions allowing the stamped slugs to fall through the die to the outside and not hang up.

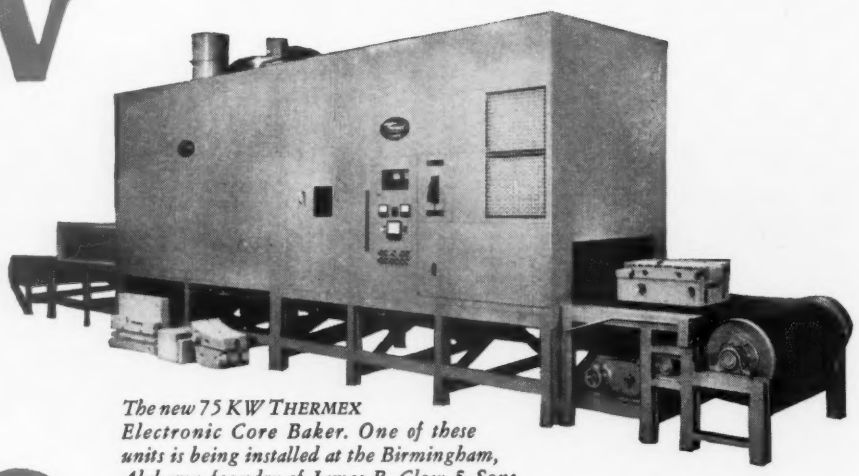
"Cities Service Delco #36 Core Oil enabled us to meet these requirements perfectly. We certainly recommend it where great strength and high collapsibility are needed."

Like Nemco, scores of other foundries have reported unusual results with problem-solving Cities Service Core Oils. Nor does the praise end with the product . . . for time and again the solution for the proper core oil has resulted from the knowledge, understanding and experience of a Cities Service Lubrication Engineer. If you have a lubrication problem, why not talk it over with one of these Cities Service experts? Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

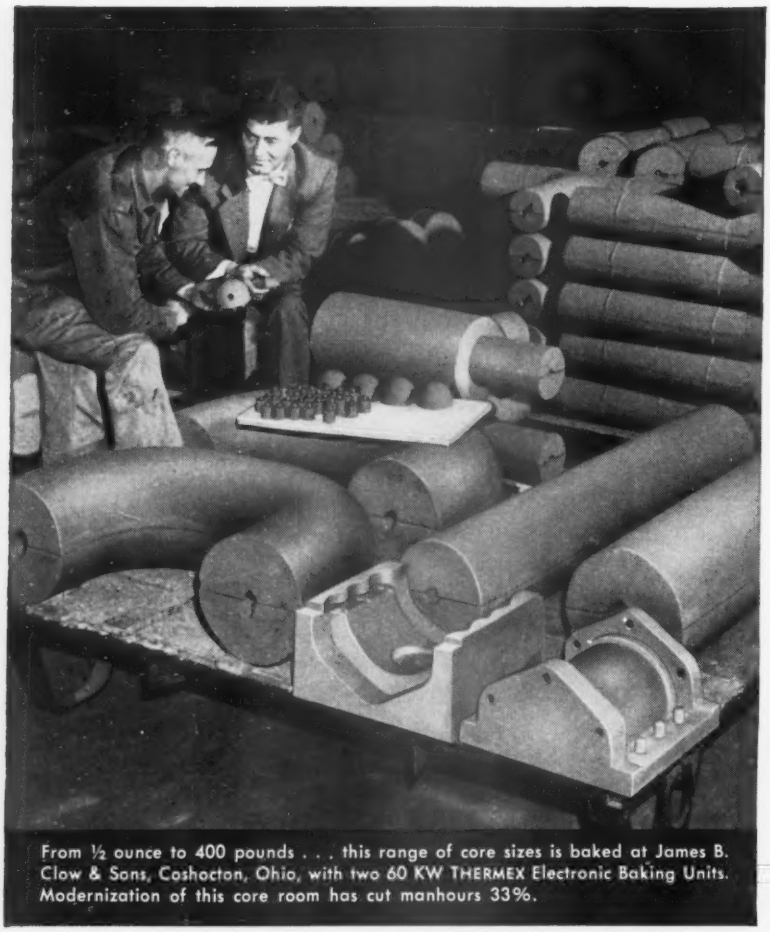
CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

# how you cut costs when you improve core quality



*The new 75 KW THERMEX Electronic Core Baker. One of these units is being installed at the Birmingham, Alabama foundry of James B. Clow & Sons.*



From ½ ounce to 400 pounds . . . this range of core sizes is baked at James B. Clow & Sons, Coshocton, Ohio, with two 60 KW THERMEX Electronic Baking Units. Modernization of this core room has cut manhours 33%.

Thermex® ELECTRONIC CORE-BAKING EQUIPMENT

BEFORE MODERNIZATION of this core room, cores had to be reinforced with steel rods to keep them from sagging. Now, with THERMEX* Core Baking Units, high-speed, high-frequency heating practically eliminates sagging. Elimination of the rod reinforcing saves manhours and rod costs.

With electronic baking you get uniform, fast baking and smooth, hard surfaces on cores of all sizes. You can reduce core loss due to breakage in handling and pouring. And, dielectrically baked cores can reduce shakeout and cleaning costs.

Find out how *you* can cut *your* foundry costs with THERMEX Electronic Baking Equipment. The Girdler Company, Thermex Division, Louisville 1, Kentucky.

*THERMEX—Trade Mark Reg. U. S. Pat. Off.

the GIRDLER Company

A DIVISION OF NATIONAL CYLINDER GAS COMPANY

THERMEX DIVISION

Luncheon session at the Southeastern Regional Foundry Conference in Birmingham

# SOUTHEASTERN FOUNDRYMEN

## Meet in Annual Conference

By FRANK G. STEINEBACH
*Editor*

AUTOMATION and mechanization of foundry operations, shell molding, quality control and melting were featured on the program of the 23rd annual Southeastern Regional Conference, held at Birmingham, Feb. 17-18. The conference was sponsored jointly by the Birmingham District Chapter, Tennessee Chapter and the University of Alabama Student Chapter of AFS.

Speaking on **New Molding Practices and Flask Design,** William G. Reichert, Automatic Foundry Equipment, Reichert Inc., Newark, N. J., stated that automation includes not only automatic equipment, but also the necessary automatic interlocking mechanisms so that one function cannot proceed before the previous function has been satisfied. In essence, Mr. Reichert pointed out, automation is the continuous processing of raw materials into the finished product. It should not be confused with mass production, which is the standardization of components.

Discussing advantages of automation, Mr. Reichert stressed the improvement in quality and surface finish of castings; reduction of manhours per ton of good castings produced; accuracy and uniformity of dimensions; better working conditions; low accident rate; a guaranteed production within limits; considerably less wear on flasks, and less breakage.

Wally E. George, George & Dix, management consultants, speaking on **Foundry Costs and Their Meaning to Foundry Supervision,** listed the objectives of a good cost system. These include the recording of costs of manufacture for monthly and annual financial statements, providing for segregation of direct costs and economical distribution of indirect costs and overheads; supplying actual cost information needed for estimating and setting selling prices; furnishing figures needed for good cost control; and affording information needed for operating of variable budget plan to control overhead.

Mr. George suggested that management develop and use the organization cost charts; utilize methods engineering to lower costs; use time study and wage incentives to control and reduce labor costs; install cost accounting, variable budgeting, cost control and supervisory cost reduction incentive plans; and strengthen the industrial relations program.

In considering **Some Aspects of the Control of Quality,** William H. Moore, Meehanite Metal Corp., said that since it is seemingly impossible to control everything in the foundry, the major variables should be controlled, letting the small ones fall into line automatically. Mr. Moore pointed out the importance of cupola blast distribution in preventing uneven melting. His organization has developed a double wind belt to assure equal air at each tuyere and help provide uniform melting.

Quality, size and density of coke should remain constant. The charge not only should have a fixed weight, but also a fixed volume. In sampling a car of coke, he suggested the use of breeze since it usually represents a cross section of coke in the car. In discussing sand control, Mr. Moore pointed to the tendency for ramming to vary between molds. He spoke of

the importance of clay bond and indicated that the sand must have sufficient moisture to satisfy the clay at all times.

Behavior of sand under the influence of heat is important, and Mr. Moore suggested trying at all times for high hot toughness, using the impact test to measure it.

The second session provided discussions on **Safety, Hygiene and Air Pollution,** with Harry E. Gravlin, Claude B. Schneible Co., Detroit, and William N. Davis, American Foundrymen's Society, Chicago, participating. Mr. Gravlin emphasized that the public no longer believes air pollution is necessary in doing business. Foundries originally built on the outskirts of a city now find the city has grown around them, and air pollution becomes critically significant.

In building industry for the future, it is necessary to have people who will continue with the organization. More and more industry is in a competitive situation for good people. The first problem is stopping pollution of air within shops, according to Mr. Gravlin, and then doing something with the polluted air when it gets outside. Catching dust at the source helps production, lowers machine and building maintenance and helps in keeping good people.

The speaker warned that unless industry is willing to do it on its own, regulations will inevitably follow. Mr. Gravlin then outlined in some detail a number of sources of air pollution and illustrated with slides the means of controlling dust at the source.

Mr. Davis discussed the work of the AFS committees handling the air pollution problem. Recently the society prepared a kit which has gone to all foundries to provide data on foundry dust and diseases caused by dusts. Committees are now working on a complete air pollution manual.

Mr. Davis then discussed government reports on safety, and complimented the steel foundry industry for the excellent improvement in its record. In conclusion, he stated that there is no reason why a foundry should have a high accident rate, but that the industry and the individual organizations must keep after the job if progress is to be made.

At the concluding session, devoted to **Shell Molding,** Palmer Derby, foundry engineer, Lynchburg Foundry Co., Lynchburg, Va., described in some detail the establishment of a new shell molding foundry by his company.

For several years Lynchburg has operated an experimental shell molding foundry. It was found during the early experimental period that most resins tested did the job that was anticipated, and today the company reports even more consistent results. The company has established a medium cure, two-stage resin as a working standard. Experience has shown it necessary to mull the sand 10 to 15 minutes, the mixing equipment being of a conventional foundry design. All sands and resins are conveyed to the mill by pneumatic equipment. Sand and resins are batched directly after the sand is discharged from the silo, and blown to the muller one batch at a time. Keeping the sand and resin in batches eliminates segregation.

Mr. Derby discussed the problem of getting uniform density on both the horizontal and vertical surfaces of the shell. It was found by the use of a glass applicator frame, that the air displaced when sand falls produces a condition not unlike that of discharging an air hose in a barrel of resin. Therefore, Mr. Derby stated that any method of by-passing the displaced air to the top of the applicator will appreciably improve mold quality. It also has been found that the lowest effective pattern and oven temperatures, will help the surface and dimensional qualities of any casting.

Speaking on **Preventive Maintenance**, B. Y. Cooper, U. S. Pipe & Foundry Co., North Birmingham, Ala., stated that to some, preventive maintenance means housekeeping, to others repairs to facilities, and to others repairing breakdowns. Another concept, which is growing, pertains to taking preventive measures before breakdown occurs. With the ever growing increase in mechanization and the trend toward automation, the need for preventing costly breakdowns through preventive maintenance is great.

According to Mr. Cooper, more than 5 per cent of the sales dollar of foundries is devoted to maintenance. Preventive maintenance, he said, will cut this cost; it also will produce information for planning budgetary control; provide tax advantages and help solve a problem resulting from the rugged treatment which foundry equipment receives. Mr. Cooper then discussed in some detail the preventive maintenance program of the U. S. Pipe & Foundry Co. He emphasized that such an organization must be tailored to fit the particular plant and type of industry.

In discussing **Mechanization and Material Handling,** Lester B. Knight, Lester B. Knight & Associates, Chicago, said that management has become the industry's greatest problem. In his opinion, a serious shortage of management personnel exists, and equipment is not a substitute. Furthermore, increased mechanization puts more load on management.

In considering mechanization, industry should strive to provide the highest take-home pay commensurate with the lowest unit cost for the product. Therefore, equipment should increase the ability of the man in the plant to produce. Mr. Knight showed a number of slides of various types

From left to right in the top row are Albert J. Fruchtl, U. S. Pipe & Foundry Co., Bessemer, Ala., vice president of Birmingham Chapter of the AFS and chairman of the conference; Bruce Simpson, National Engineering Co., Chicago, vice president of the AFS; and J. O. Klein, Texas Foundries Inc., Lufkin, Tex., a national director of the AFS. Lower view shows the speaker's table

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of mechanized plants, indicating the reasons for the mechanization and the advantages obtained.

There is no question that automation is here to stay, but, according to Mr. Knight, there are some big problems yet to be solved. Unless a proposed mechanical installation will pay for itself in three years, it is better not to adopt it. He advised a comprehensive study to determine strength and weakness of past operations and the foundry's future mission. Without such a survey, money may be spent without benefit. In conclusion, he stressed the importance of using full facilities of equipment, such as using flasks up to the size of machine.

**Melting** was the subject at the two sessions concluding the technical program. At the ferrous session, Wesley J. Estes, U. S. Pipe & Foundry Co., North Birmingham, described the operation of the plant's three 108-in. balanced blast cupolas. The stacks have been cut off so that the cranes pass over the top of the cupola for depositing the cone-type charging bucket. This is one of the few installations in the country of this type.

### Determine Coke Split Weight

The cupolas, lined to 88 inches, operate nine hours a day with about 11 or 12 feet of burden above the coke bed. Iron is tapped continuously into a 15-ton forehearth ladle, and from that ladle to 6000-lb transfer ladles for delivery to the casting department.

Mr. Estes described a series of experiments to determine the amount of coke that should be added to each charge. It resulted in establishment of a coke ratio of 16 to 1—500 lb of coke to 8000 lb of metal. This has proved satisfactory by adding booster charges of 300 to 500 lb throughout the day. Data developed by the experiments provide a starting charge of 500 lb, the use of increment charging each hour until 550 lb of coke per charge is reached. From then on, the same amount of coke is used and the bed seems to maintain its height for the rest of the heat, whether operating 8, 10 or 16-hr periods.

H. L. Smith, Federated Metals Division, American Smelting & Refining Co., Whiting, Ind., in considering melting copper-base alloys, pointed to steps taken in recent years to provide quality ingot. In foundry production, these five factors must be controlled: Composition of metal; melting practice; gates and risers; chills; and design.

Properties desired in the finished casting dictate the basic composition. Melting practice also involves the

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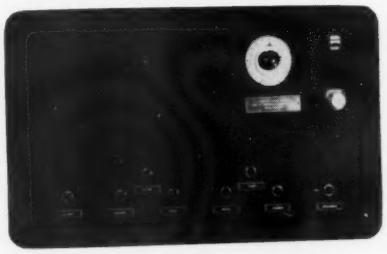

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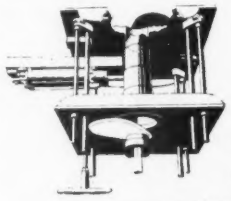

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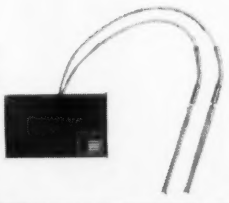

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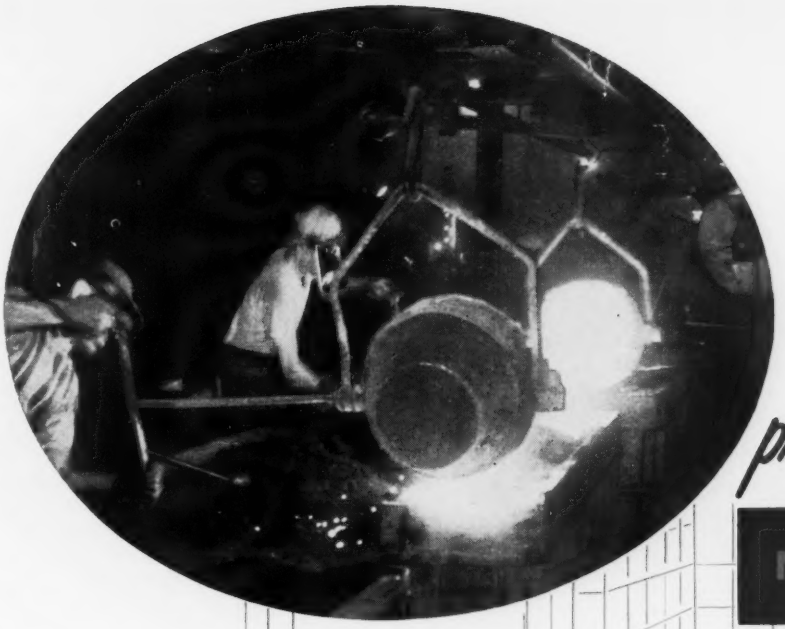

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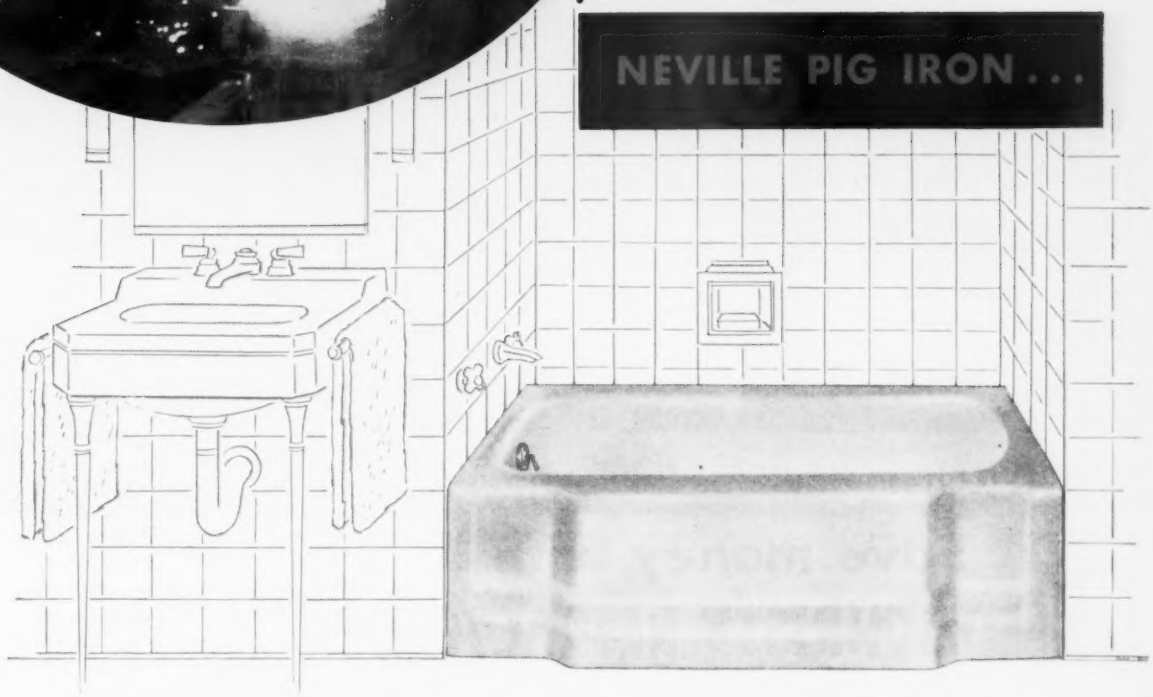

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GRAY iron castings for modern bathtubs must meet many unique and rigid requirements. The Richmond Radiator Company, for example, demands pig iron that will cast with a high degree of fluidity to produce large, clean castings approximately 7/32" thick. The castings must be sound and free of porosity to resist the thermal shock of the enameling process in which the temperature of the casting is elevated from room temperature to 1700°F. And to assure a constant matching of the coefficient of expansion between the enamel and the casting, *uniform* pig iron quality is a "must."

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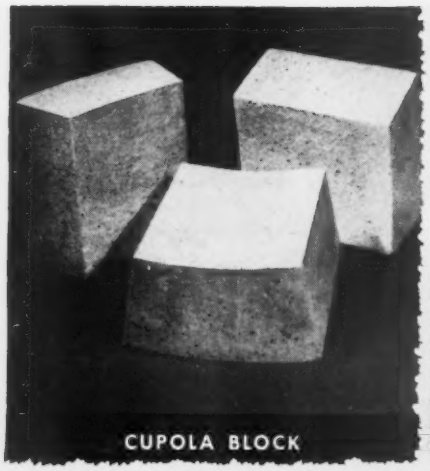

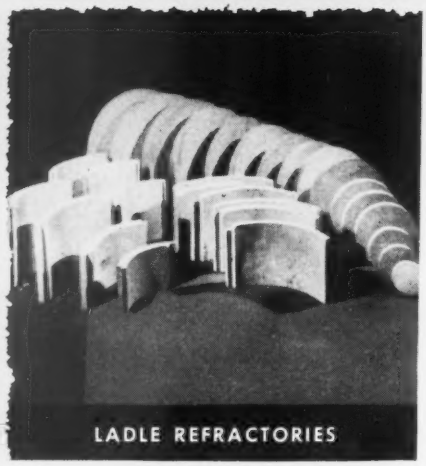


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composition since furnace gases and water vapor may be absorbed by the melt. Oxidizing melting is considered the surest way to produce good castings, but an excess of oxygen may slow down the melting cycle or increase fuel consumption. Reducing conditions appear to speed up melting, but metal that is in the furnace too long will absorb the reducing gases, and possibly will result in porous castings.

Generally 6 per cent shrinkage of the metal in the mold must be compensated for by some type of feeder, and the direction of solidification must be controlled by chilling the metal at the proper places.

At the annual conference luncheon, William W. Maloney, general manager of AFS, outlined plans for the 1955 annual convention, and stressed the importance of each foundry being represented at the Houston meeting. He indicated that many new things would be discussed in the convention's technical papers.

Bruce L. Simpson, National Engineering Co., Chicago, and vice president of AFS, presented a thought-provoking discussion of the society, touching on its growth and development, where it is today, and what should be considered for the future. Mr. Simpson recommended the establishment of a program evaluation committee to chart the course for the future.

The annual banquet on Friday evening featured an address by Dr. Houston Cole, president, State Teachers College, Jacksonville, Ala. E. E. Pollard, chapter chairman, presided and Warren Whitney, vice president, James B. Clow & Sons, Birmingham was toastmaster.

## Foundry Equipment Makers Will Meet on Apr. 15

Foundry Equipment Manufacturers Association will hold its spring meeting at the Sheraton-Carlton Hotel, Washington, Apr. 15. Guest speakers will include Joseph E. Flanagan, U. S. Public Health Service, Cincinnati, and Prof. Theodore F. Hatch, School of Public Health, University of Pittsburgh, Pittsburgh.

W. B. Wallis, FEMA president, said that discussions will be held on technical subjects of interest to the various product groups comprising the major components of foundry equipment—namely, blast cleaning and tumbling, dust and fume control, flasks, furnaces and accessories, material handling and processing and molding machines. These discussions will be of interest to manufacturers of the equipment concerned.

*Reading Gray Iron Castings Inc. uses cores made with Borden Phenol Resin to cast these man-size parts for photo-composing machine.*

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At Reading Gray Iron Castings Inc., you'll find cores for castings ranging from featherweights to heavyweights that often top 1300 pounds. And for both extremes, Reading has found Borden's Phenol Resins to be the ideal core binder.

For large cores, Borden Resins provide the quick, thorough curing necessary to avoid blows. In the smaller, more intricate cores, these resins permit either hand-ramming or blowing and guard against imperfections often caused by sponginess. For *all* sizes, these resins assure clean, smooth-cored surfaces . . . help reduce scrap.

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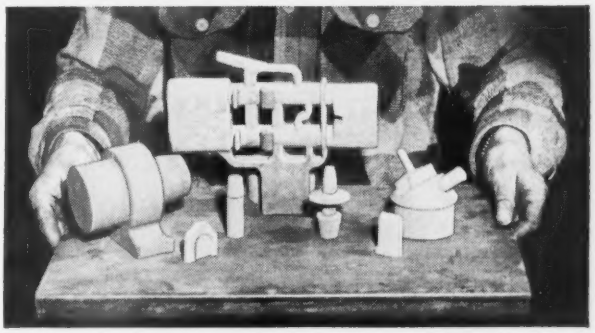

*Samples of the wide variety of intricate small cores turned out by Reading Gray Iron Castings Inc. with Borden Phenolic Resin.*

**FOUNDRY RESINS**

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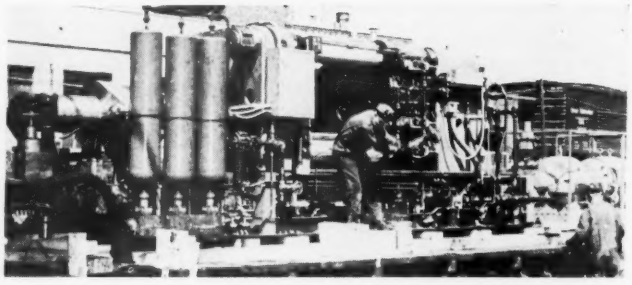
# NEWS VIEWS

REGIONAL MEETING: At a January regional meeting in Detroit of the National Foundry Association, 70 representatives of foundry management heard James I. Poole, Milwaukee labor attorney, discuss "Crisis Bargaining" as it pertained to foundry labor relations. Shown above at the speaker's table are Donald Pigott, Consolidated Brass Co., Detroit; C. T. Sheehan, executive secretary of the NFA, Mr. Poole; C. L. Fronner, Mueller Brass Co., Port Huron, Mich., meeting chairman; M. J. Ewald, regional counsel, NFA, and G. A. Kastner, Lincoln Brass Works Inc., Detroit. Management techniques and strategies at the bargaining table, necessity of keeping supervisory personnel informed of bargaining developments and methods of informing the working forces of management's views were discussed



KING-SIZED DIE CASTER: One of the largest die casting machines of its type ever built, above, is shown being unloaded at the Kiekhaefer Corp. plant, Cedarburg, Wis. The 1000-ton unit, manufactured by Hydraulic Press Mfg. Co., Mt. Gilead, O., is 26 ft long and has injection pressures up to 40,000 psi. It will cast aluminum up to 40 lb in weight for use as parts of outboard motors

IN APPRECIATION: George F. Willson, left, is holding an engraved watch presented to him by M. W. Reynolds, right, general manager of the Acheson Colloids Co., at a testimonial dinner on the occasion of Mr. Willson's retirement. He joined the Acheson family in 1917 and has represented them in Ohio for more than a quarter century

NO LEAKS HERE: Sales engineers of Edward Valves Inc., East Chicago, Ind., were told at a recent meeting that maximum leakage of one cubic centimeter in 100 years cannot be tolerated in valves used to control radioactive materials in nuclear power plants. David MacGregor, works manager, above, explains how body castings are tested

# Coming in May ... 1955 PRE-CONVENTION ISSUE.

**SPECIAL EDITORIAL REPORT**

# FOUNDRY PROCESSES AND PRODUCTS

**IN FIVE PARTS**

• To appear complete in the May Pre-Convention issue of FOUNDRY—*another editorial-plus feature* at convention-time. This year's special report will describe new developments and trends in these five categories:

1. **MOLDING**—Shell, Pressure, Investment, Plaster, Centrifugal, Permanent, Die Casting, Gating, Patternmaking.
2. **MELTING**—Basic Cupola, Hot Blast and Vacuum.
3. **METALS**—Pearlitic Malleable, Nodular, High Alloy, Bronzes, Aluminum, Magnesium, Titanium.
4. **TESTING**—X-Ray, Magnaflux and Gamma Ray testing of metals, Sand testing.
5. **HEAT TREATMENT**—Malleable, Steel, Gray Iron and Nonferrous castings.

Leading authorities who are well qualified to discuss their subjects from a practical as well as technical foundry "slant" have been asked to prepare reports for this special editorial feature—their 27-plus discussions will constitute an important contribution to foundry "know-how" at this time.

## Contributors

**MOLDING**

Shell— J. E. Bolt, General Electric Co.
Pressure—T. E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp.
Investment—Ted Operhall, Misco Precision Casting Co.
Centrifugal Casting—Dr. A. E. Schuh, U. S. Pipe & Foundry Co.
Die Casting—J. C. Fox, Die Casting Consultant.
Gating—J. G. Kura, Battelle Memorial Institute.
Permanent Mold Casting—Alfred Sugar, Alloys & Chemicals Mfg. Co. Inc.
Patternmaking—J. F. Roth, Cleveland Standard Pattern Works, Inc.

**MELTING**

Basic Cupola—C. K. Donoho, American Cast Iron Pipe Co.
Hot Blast Cupola—G. P. Phillips, International Harvester Co.
Vacuum Furnace—W. S. Pellini, Naval Research Laboratory.

**METALS**

Pearlitic Malleable—Dr. W. K. Bock, National Malleable & Steel Castings Co.
Nodular Iron—T. E. Eagan, Cooper-Bessemer Corp.
High-Alloy Steel—C. K. Lockwood, Stainless Steel & Alloys Division, Shawinigan Chemicals Ltd.
Bronzes—J. S. Vanick, International Nickel Co.
Aluminum—Floyd Lewis, Aluminum Association.
Magnesium—Dr. T. E. Leontis, Dow Chemical Co.
Titanium—R. E. Edelman, Frankford Arsenal.

**HEAT TREATMENT**

Malleable Iron—Milton Tilley, National Malleable & Steel Castings Co.
Steel—C. B. Jenni, General Steel Castings Co.
Gray Iron—C. F. Walton, Gray Iron Founders' Society.
Brass & Bronze—R. A. Colton, Federated Metals Division, American Smelting & Refining Co.
Aluminum—D. L. LaVelle, Federated Metals Div., American Smelting & Refining Co.

**This Issue Will Also Feature**

THE CONVENTION PROGRAM and full detail on the Houston meeting (59th annual convention of the American Foundrymen's Society, May 23-27, 1955).

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# 59TH ANNUAL FOUNDRY CONVENTION

**Houston, May 23 to 27, 1955**

## May PRE-CONVENTION ISSUE

**FEATURING . . . .**

**A Special Report on:**

## • FOUNDRY PROCESSES AND PRODUCTS

Leading authorities discuss new developments and trends in:
MOLDING - MELTING - METALS - TESTING - HEAT TREATMENT

**• PREVIEW OF THE 1955 CONVENTION**

Program of Technical Sessions
Convention Activities
Committee Personnel

## July POST-CONVENTION ISSUE

**REPORTING . . .**

**The Convention Activities**

Editorial news and picture reports on the technical sessions and convention activities

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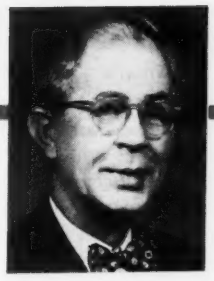

# MAN-TO-MAN

By RALPH L. LEE

## Digging out the Data

*"Let's set up a foundation devoted exclusively to the translation of our splendid foundry library into the ordinary foundry lingo"*

I HAVE never compared my collection of foundry textbooks, magazine articles, catalogs, tables, clippings and notes with that of anyone else, but from the room it takes up I'll bet it would make quite a showing. I've got so much stuff it sometimes take me longer to find a bit of information than it would to correct the mistakes I'd make going ahead without it.

I'm exaggerating a b't, of course, but just the same, even with the best cataloged and most orderly foundry library, it's frequently quite a chore to find out first if what you want is there at all and then how to put your finger on it. Someone, I forget who, said that the principal advantage of a college education is learning where to look for information. I think he may well have added, ". . . and how to tear the information loose from all of the seemingly irrelevant embroidery that frequently hides it."

Although I am sure that we can never have too much research, I'm afraid that we would be in for quite a shock if we learned what a tiny percentage of what we already know is being put into practice by the vast majority of foundrymen, who seem to be getting along surprisingly well on that tiny bit.

At a recent meeting of the ASMFM (The American Society of M'ghty Foundry Midgets, a bull session at the Lee Hobby Foundry of foundrymen from a small shop), the subject of cupola operation came up and was kicked around all over the place. One of the fellows felt very strongly that their lining was burning out too fast. His complaint automatically led to a discussion of height of bed, burning-in time, coke size and ratio, blast and tuyere area. 'Round and 'round they went, with very few measurable facts in common among them. Usually the fewer facts there are, the more thrilling the argument.

Being an amateur with a 10-in. cupola, I stayed pretty much out of this conversational ping-pong game till they sort of ran down, whereupon I asked, very friendly like, "Why don't you get in touch with the folks who made your cupola? I'm sure they'd be glad to help."

It turned out that they hadn't bought their cupola, they had built it themselves—that is, the old man (as they called him) who had founded the business had built it and played around with it till it melted iron.

Since the iron seemed to satisfy the customers and the customers kept on multiplying, along with healthy profit and expanding plant, the boys were taught to let sleeping dogs lie as far as cupola operation was concerned. When they showed any signs of curiosity as to what was going on elsewhere or an urge to experiment a bit, the old man reminded them in no uncertain terms that not only had they been getting along all right all these years, but they were still getting along all right.

But, with lots of water over the dam and the boys having proved themselves to the old man's satisfaction, he kept spending more and more time away from the business. Recently they had arrived at the point where they were actually running the business, with practically no interference. So, still keeping before them the very real danger of throwing experimental monkey-wrenches into the works, they felt the time had come to back out of the old familiar woods a bit and look cautiously for safe ways of improving their operating methods.

Getting back to the meeting, toward the shank of the evening I said to the boys, "Now, look, I'm no expert on cupolas, but I do know this: In spite of differences of opinion and method, there are certain basic physical laws which must be taken into account, either knowingly or unknowingly, when you're running a cupola. It seems to me that you boys have got to get hold of some facts on these principles before you even can be sure that your lining is burning out too fast. Maybe it isn't.

"Tell you what I'm going to do," I beamed. "I'm going to loan you my cupola handbook, but I want it back, not gathering dust in some corner. I'm in the midst of reading it from cover to cover." They weren't as enthusiastic over my offer as I had thought they would be. The truth of the matter is, they were gun-shy of so-called technical reading in any form. None of them had been to high school, let alone college, and the shades of the old man still hovered.

This being the case, chemistry was Greek, algebra Chinese, and even the most elementary terms in physics were completely over their heads. But the funny thing was, and I mentioned the fact, that no matter what it was called, chem'stry and the most complicated antics of physics were going on every day inside their cupola, at their command and for all practical purposes. They were managing very well, and they knew one whale of a lot about what they were managing; they spoke a different language from that used by most of the book writers, but they weren't ignorant by a darned sight.

I don't imagine there ever will be a short cut through this dilemma that will release the loads of useful information available to the majority of our foundrymen who could profit the most from it. But two suggestions raise their heads for attention.

First, no practical foundryman who has proved his worth by making usable castings at a profit has any right to pose as or feel like an ignoramus in the presence of book writing or book learning or to shy off from useful information just because it seems to be imbedded in sci-

SHEPARD NILES Hot Metal Carrier

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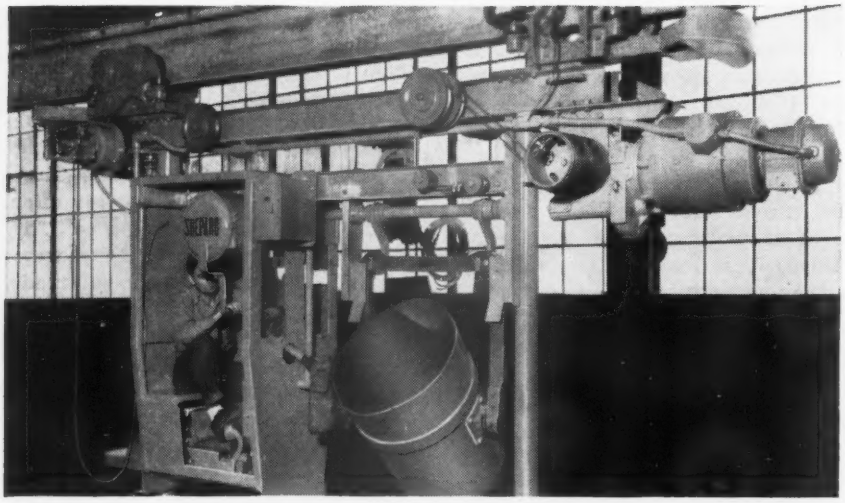

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With a Shepard Niles Carrier, molten metal travels from cupola to pouring line in a minimum of time. The carrier cab is on the same level as the metal itself, enabling the operator to see perfectly for precision pouring.

Write today for Bulletin describing Shepard Niles Hot Metal Carriers. Ask to have a representative call. He'll show you how to mechanize your foundry for labor-saving, low-cost handling.

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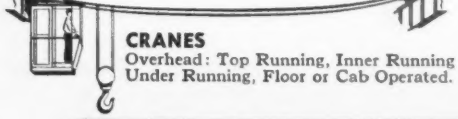

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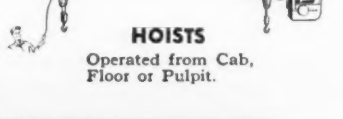

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entific hieroglyphics and decorated with academic flourishes.

If the unschooled (in book learning only) will take the time to read between the lines of the seemingly scientific lingo of the FOUNDRY *Glossary of Foundry Terms* or of some other good foundry dictionary, he'll find gold in them thar hills of books and stuff. But it will take a lot of patient digging—a far cry from whisking through paperbacked whodonits. As one of the multitude who hasn't gone to a foundry college or high school, I know from experience that after you break the ice, the going gets easier the farther you get.

My second suggestion is that persons called upon to write papers, books and articles for foundrymen or to make speeches to groups of them should keep in mind that the vast majority of foundrymen do not speak Greek. It's a darned sight easier for those who speak both Greek and foundry lingo to do the translating. No reputable scientist will ever lose caste in being understood by the rank and file.

Another thing might be in order: each of the points through which a researcher draws a curve may be packed with scientific sex appeal to the researcher who sweats all day over a hot retort, but to the bulk of foundrymen, these points are just pains in the neck. It's the "SO WHAT?" that interests them. And after all, it's the "SO WHAT?" that climaxes even the most exciting scientific dramas for both the scientist and the layman.

We'll always need a lot more research; in fact, I'd like to suggest still another project. Let's set up a foundation devoted exclusively to the translation of our splend'd foundry library into foundry lingo—the kind that many of our foundrymen speak. Let's do this without the slightest taint of condescension, paternalism or holier-than-thouness, for these foundry boys know their onions. They have to turn out all the castings they pour and sell.

## AMA Publishes New Booklet

Social Security changes and their effect on company retirement programs, plus a discussion of the workmen's compensation risk, are topics of a new publication of the American Management Association, 330 West 42nd St., New York 36. The 32-page booklet, "Keeping Up to Date on Social Security and Workmen's Compensation," is priced at $1.75 ($1 to AMA members).

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The plastic form of this material makes it adaptable for economical patching and lining construction where it is not practical or convenient to use standard fire brick. It is intended for use in those places where high duty fire brick would ordinarily be adequate.

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Is a slag-resistant plastic refractory which is at its best when in contact with molten metal or under reducing conditions. It has proven exceptional when used in foundry ladles, spouts and blast furnace runners.

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Can be used under the most severe furnace conditions. It has a refractoriness and composition similar to that of Super Duty fire brick. It serves the purpose of patching or replacing installations where appreciably higher refractoriness is necessary.

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Cupola blocks and fire brick are available in super duty, high, intermediate and low duty qualities, as well as in high alumina grades. Mortars of various grades and types for all kinds of service can be supplied.

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# INTERNATIONAL TYPE JJR-JJ MACHINES

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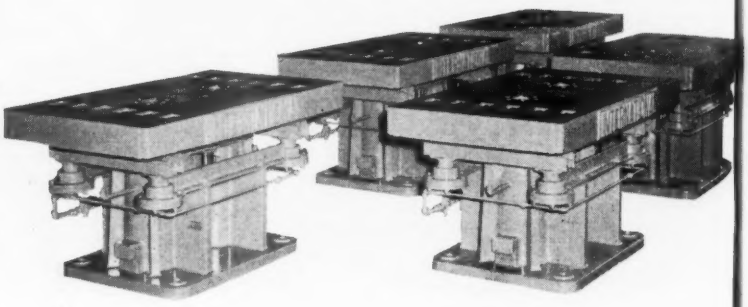

The International JJ and JJR Machines incorporate the Double Jolt feature and the sturdiness so necessary to give a positive ram throughout the core or mold.

750 lb. to 10,000 lb. jolt capacity.

On JJR Machines, rollers can be designed for loading and unloading in any direction, and are lowered by air cylinders before jolting.

The International Type JJR Machine illustrated at top has a table size 72"x100", 10,000 pound jolt capacity. The International Type JJR Machines illustrated below it have a table size of 48"x72", and a 5,000 pound jolt capacity.

Table sizes can be made to suit individual requirements.

NOTE: THE TYPE JJ MACHINE IS THE SAME AS THE TYPE JJR EXCEPT THAT IT DOES NOT HAVE ROLLERS.

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# ACTIVITIES OF FOUNDRY GROUPS

**Washington:** February meeting of the AFS chapter was held at the Stewart Hotel, Seattle, with 58 members and guests in attendance. William Pindell, a national director of the AFS, offered assistance from the national office on any chapter problems, in a short talk. Nominations were accepted for chapter officers for the coming year.

Apprentice contest of the chapter was judged during the meeting, with the following awards being made in the divisions mentioned: David Sullivan, Pacific Car & Foundry Co., patternmaking; Wayne E. Myrick, Puget Sound Naval Shipyard, steel; Naaman B. Peterson, Puget Sound Naval Shipyard, nonferrous; and William Knapp, Sumner Iron Works, iron.

Guest speaker was Warner B. Bishop, Archer-Daniels-Midland Co., Cleveland, whose subject, "Common Sense in Core Rooms," outlined factors which could decrease coreroom costs from 10 to 50 per cent. Accurate measurement of materials was stressed first. Mixture of materials, with placement of materials in proper sequence in the mixing mill, is very important. Speaker suggested adding the cereal, then water, and then the core oil to the mixer to obtain uniform cores.

Controlled moisture is essential. Moisture content change of 1 per cent can change the green bond of sand by 50 per cent. Finally, Mr. Bishop stated that the proper baking of cores is of greatest importance. Temperature of core ovens often varies as much as 150° throughout. It is bad practice to bake cores at 500° or higher to speed up baking procedure—*William K. Gibb, Atlas Foundry & Machine Co.*

**St. Louis:** On Feb. 10 guest speaker of the AFS chapter was R. M. Serota, manager, Coleman Dielectric Division, Foundry Equipment Co., Cleveland. Mr. Serota discussed fundamentals of dielectric heating as applied to baking of cores with a sand, water and resin mix. Advantages cited were low baking temperature, rapid curing, uniform heating, accurate control and reduced core handling. Special consideration should be given to variation in core size, plastic core driers and use of wire and rods. An interesting question-and-answer period followed the talk.

John O'Meara, entertainment chairman, announced details on the chapter's second annual dinner dance to be held Apr. 16, at Norwood Hills Country Club. At the next regular meeting members of the Missouri School of Mines Chapter will be guests of the chapter.—*Jack R. Bodine Jr., Bodine Pattern & Foundry Co.*

**Connecticut:** February meeting of the Connecticut Non-Ferrous Foundrymen's Association was held at the Quinnipiack Club, New Haven, Conn. R. J. Hesenperger, sales manager, PneuBin Division, Gerotor May Corp., Baltimore, in his talk on "PneuBin—Its History and Application in the Foundry," dealt with bin or hopper problems and their correction.

The PneuBin unit consists of steel-backed, neoprene, pulsating panels mounted on the inside wall of bins,


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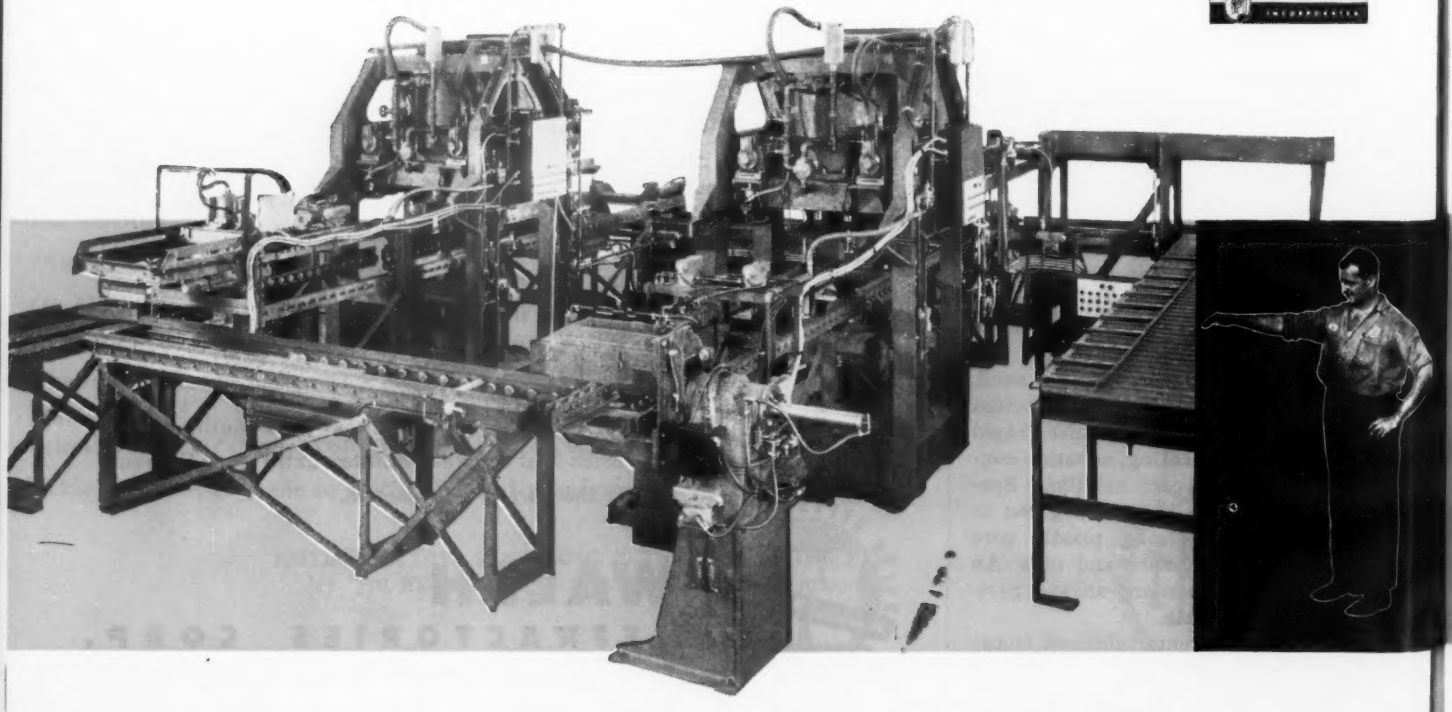
SPOMATIC is the trend-setting molding machine designed to bring automation to foundry operations . . . to make the "foundry of the future" a reality today! Write for Bulletin "MM" for additional details.



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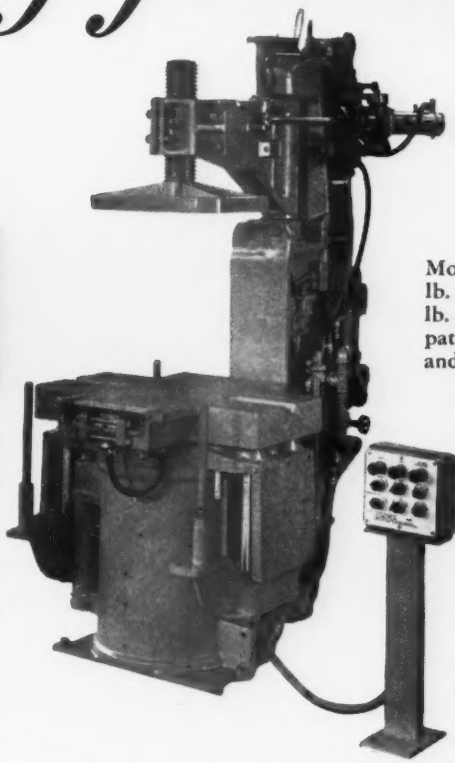
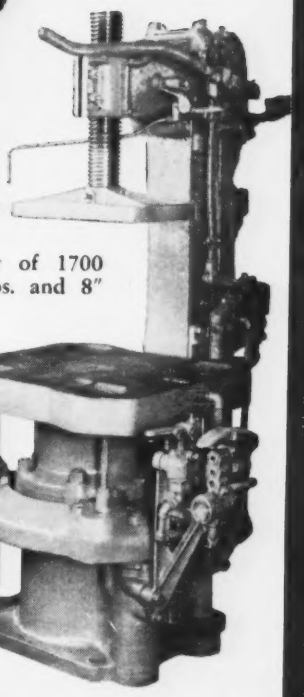
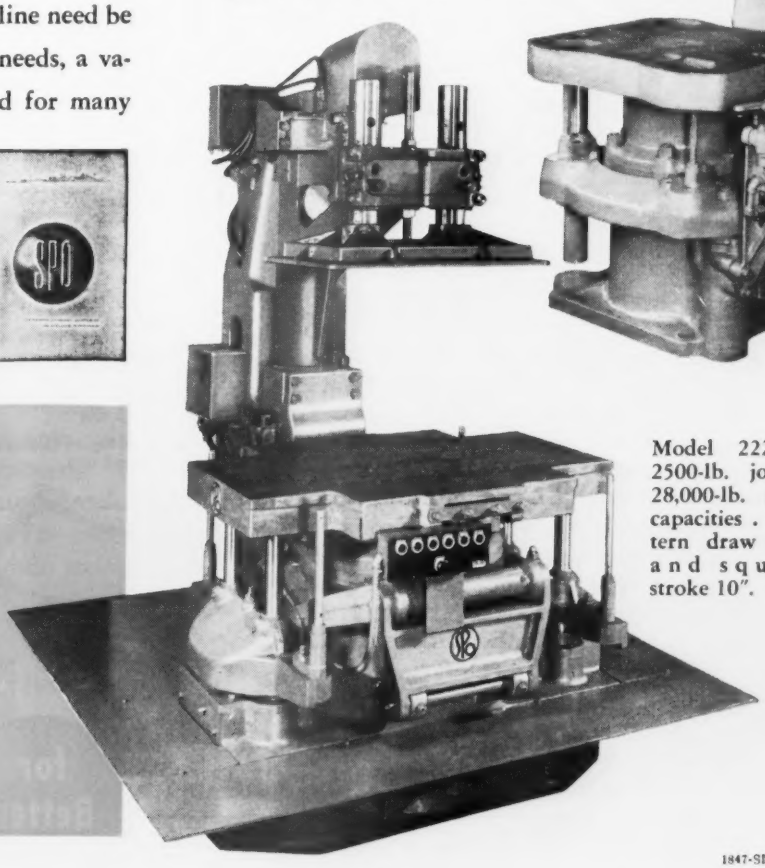
*The SPO molding machines illustrated on this page are only a few examples of types and sizes available today. Write for new 8-page bulletin for additional details.*



Model 2160-C has 1500-lb. jolt capacity, 16,000-lb. squeeze, adjustable pattern draw (6 to 10") and 12" squeeze stroke.



Model No. 165 has jolt capacity of 1700 lbs., squeeze capacity of 16,000 lbs. and 8" pattern draw.



Model 2222 has 2500-lb. jolt and 28,000-lb. squeeze capacities . . . pattern draw is 12" and squeeze stroke 10".

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From him you can get a variety of sling chains to the length you need, with your choice of sling, grab, or foundry hooks and fittings that will fit the sling exactly to your work. For instance, you can get ACCOLOY sling chains in sizes from ¼" to 1¼" that have four-leg working load limits from 9,500 lbs. to 199,000 lbs. at a 60° angle. These limits are not theoretical. They are based on actual proof-testing of each completed ACCO *Registered* Sling Chain to insure safe operation.

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with air controls to regulate their action. By pneumatic inflation and deflation of panels, bin contents are displaced to insure free flow. After the panels have deflated, the air control unit, operating from the plant air supply, starts another cycle of inflation and deflation, at whatever frequency is set on the air controller. Speaker described construction and operating principle of the equipment and discussed specific installations which had successfully corrected problems in large capacity storage, prepared sand surge hoppers, and molders' hoppers.—*Frank B. Diana.*

**Southern California:** Monthly meeting of the AFS chapter was held Feb. 11 at Rodger Young Auditorium with 107 foundrymen present. Warner B. Bishop, manager, Foundry Products Division, Archer-Daniels-Midland Co., Cleveland, spoke on "Common Sense in Cores." He gave four rules for saving costs in the coreroom. They include measurement of mix by weight, proper sequence in mixing, correct moisture content and proper baking cycle. The lecture was followed by an extremely interesting question and answer period.

Next meeting, Apr. 15, will feature George E. Miller, sales manager, San-Blo Division, Federal Foundry Supply Co., Cleveland, who will discuss "Sand Ramming By Blowing." —*W. G. Stenberg, U. S. Electrical Motors Inc.*

**Eastern New York:** Panel discussion on casting defects attracted more than 50 members and guests to the February meeting of the AFS chapter, at Panetta's Restaurant, Menands, N. Y. Members of the panel included: Jack Keverian, General Electric Research Laboratory; Jasper Wheeler, Wheeler Bros. Brass Foundry; Howard B. Nye, Crompton Knowles Loom Works; and Ambrose Marchand, Adirondack Foundries & Steel Co. Scrap castings were brought to the meeting by local foundrymen for inspection and comment by the panel.—*L. J. DiNuzzo, General Electric Co.*

**Western Michigan:** Frank B. Rote, technical director, Albion Malleable Iron Co., Albion, Mich., in a discussion of "Stack Molding," held the attention of approximately 130 members of the AFS chapter, Feb. 7, at Bill Sterns', Muskegon Heights, Mich.

Blow-squeeze stack molding requires understanding of new concepts of integration of molding, stacking, pattern equipment and sand for mass production of green sand castings having irregular parting. Mr. Rote

Designed especially for small job foundries and for experimental work, the new Gee Shell Mold Machine features simplicity, economy and ease of operation. Manufactured by the Metco Processing Corporation, Ypsilanti, Michigan, the Gee requires only air and gas service for complete installation. Shell molds and cores may be made separately or simultaneously from patterns up to 20" x 30" x 6".

# Simplify Shell Molding with DOW CORNING 8 EMULSION

- **Assure Fast, Positive Release**
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Shell molding becomes easier, more accurate, and more economical when you use Dow Corning 8 Emulsion. Especially designed for the shell process, this silicone parting agent gives you clean, easy release every time with little or no build-up on even the most complex patterns. Cleaning costs are minimized, and you obtain increased production of shells with uniform dimensional accuracy. For more information and a free trial sample, return the coupon today.

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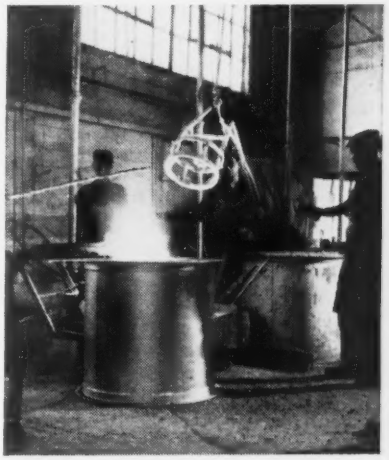
That has been the experience of maintenance men at the Saginaw Bearing Co. of Saginaw, Michigan, in testing various paints on their bronze-melting furnaces. Six months ago, after wire brushing a furnace to bare metal, they brushed on a single coat of straight silicone-aluminum paint. Cured in service, the coating is still in near-perfect condition. Compare its appearance in the photo foreground with that of the second furnace which was recoated with organic paints dozens of times during the past six months.



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In addition, many indirect benefits (fewer drops—better casting finish—minimum porosity—lower scrap losses—increased production—a cleaner foundry) are made possible.

Dietert-Detroit Automatic Sand Tempering and Automatic Cycling Equipment will allow you to achieve control in this order—

| Batch No. | % Incoming Moisture | Sand Temp., Degrees F | % Outgoing Moisture |
|---|---|---|---|
| 1 | 1.0 | 70 | 3.8 |
| 2 | .6 | 70 | 3.9 |
| 3 | .45 | 110 | 3.8 |
| 4 | .3 | 130 | 3.8 |
| 5 | .35 | 165 | 3.9 |

**Every foundry is fighting ever mounting costs and shrinking profits. Investigate the cost reducing possibilities offered by Dietert-Detroit Automatic Sand Tempering—Cycling—Bond Addition and Sand Distribution Equipment.**

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CONTROL EQUIPMENT
SAND · MOLD · MOISTURE
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explained sand requirements and described control of sand, citing engineering problems experienced on his company's production line. Examples of stack-molded rocker arms and a color movie showing operation of the line were presented. — *Wilson W. Hicks, Sealed Power Corp.*

**Twin City:** Approximately 60 members of the AFS chapter met Feb. 8 at Covered Wagon Restaurant, Minneapolis, and heard D. L. LaVelle, Federated Metals Division, American Smelting & Refining Co., Perth Amboy, N. J., whose subject was "Aluminum Casting Defects and Their Correction." Particular emphasis was placed upon pouring practice. Whatever means are necessary in refinements of either patterns or gating, "to keep the sprue full and the ladle down," are worth the effort. Mr. LaVelle pointed out gating practice faults, and suggested gating on the cope side of the runner.

Carter DeLaittre, superintendent Minneapolis Electric Steel Castings Co., Minneapolis, and Wayne Carlson, foundry engineer, American Hoist & Derrick Co., St. Paul, reported on the safety record of Twin City foundries. Of all accidents reported, a large majority occurred at the shakeout.—*R. J. Mulligan, Archer-Daniels-Midland Co.*

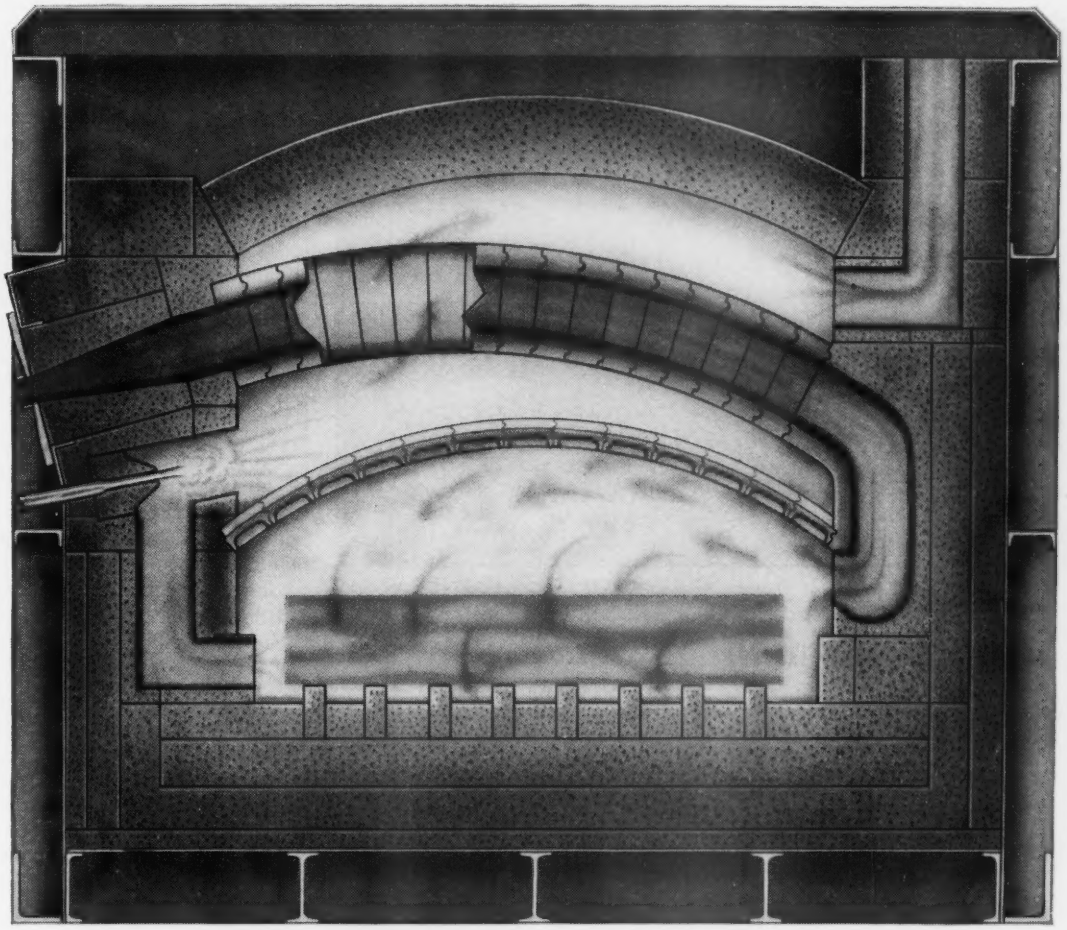
**Northeastern Ohio:** Patternmaking division presented the February meeting of the AFS chapter at the Tudor Arms Hotel, Cleveland. G. A. Pealer, casting design engineer, General Electric Co., Elmira, N. Y., spoke on the pattern engineer's function in producing better castings at lower cost.

Proper procedure in quoting on patterns includes checking design for possible improvements and determining the length and amount of production runs. The pattern engineer must see in a blueprint those design faults that might cause the foundry expense or trouble in the production of castings. Numerous cost studies show the advantages to be gained in engineering the casting and the pattern for the job they are to perform. —*Byron E. Kennel*

**Metropolitan Brass:** Election of officers to serve the Metropolitan Brass Founders' Association during 1955 was held on Jan. 11. Raymond E. Bietry, B & S Bronze Foundry Inc., was elected president, Robert Riescher, Sunnyside Bronze Foundry Inc., vice president, and John C. Spring, Modern Art Foundry Inc., secretary-treasurer. George Staub was was re-elected executive secretary.

At the March meeting, held at

# *Another Norton* Rx *on the job!*



Cross-section of a Lithium Company two-stage hot atmosphere recuperative furnace for scale-free heating of ferrous and non-ferrous metals for precision forging and rolling. The segmented conduit, a Lithium Company design, is made of Norton CRYSTOLON tongue and groove tiles. Fired shapes of this same material form the side walls. Burner block is of ALUNDUM refractory material.

## *Lithium Company specifies long-life ALUNDUM* and CRYSTOLON* refractory shapes for its atmosphere furnaces*

The Lithium Company of Newark, N. J., well-known builder of atmosphere furnaces, reports excellent results from Norton refractories.

The Lithium designed refractory shapes are Norton CRYSTOLON Silicon Carbide. They were selected for their hot strength, high refractoriness, thermal conductivity, and low thermal expansion. They give long, trouble-free service life at temperatures up to 2900°F. ALUNDUM refractory material was the choice for the burner block because of its high refractoriness and resistance to chemical influences at temperatures up to 3450°F.

### *For your own furnace operations*

It will pay you to investigate how Norton Rx's — *engineered and prescribed* refractories — can help you save time, work and money. See your Norton Representative or write to NORTON COMPANY, Refractories Division, 303 New Bond Street, Worcester 6, Mass. *Canadian Representative:* A. P. Green Fire Brick Co., Ltd., Toronto 5, Ont.

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Building Trades Employers' Club, New York, metal prices were discussed. Effect of increase in metal prices affecting the brass industry over the past year, was considered. The new president outlined his program for 1955.—*George Staub.*

**Pittsburgh:** Approximately 100 members of the Pittsburgh Foundrymen's Association met Feb. 21 to hear Dr. C. R. Austin, director of research, Meehanite Metal Corp., New Rochelle, N. Y. In his talk, "Heat Treatment for Improved Casting Properties," Dr. Austin stated that through heat treating the best possible properties are obtained from alloys. Methods were shown to measure hardening for better strength and hardenability. Close temperature control was stressed.

Flame hardening is growing steadily more important as fabricators thereby secure hardness where it is needed. It remains essentially a technique for surface hardening, to within 1/16-in. of the surface. He showed examples of employment of flame hardening and said much remains to be developed in this technique.

Executive committee of the association is investigating procedure for affiliating with the American Foundrymen's Society.—*Robert Love.*

**Reading:** Round-table discussions featured the Feb. 15 meeting of the Reading Foundrymen's Association in the Berkshire Hotel. Dr. J. P. Brull, chief metallurgist, North American Smelting Co., Wilmington, Del., addressed the brass and bronze group. W. S. Flinchbaugh, foundry superintendent, York Corp., York, Pa., was speaker for the gray iron group, and Edward H. Berry, foundry manager, Dodge Steel Co., Philadelphia, spoke before the steel group.—*W. I. Cassidy.*

**Northwestern Pennsylvania:** Largest meeting of the season was held Feb. 28, at the Erie, Pa., Moose Club. Walter E. Sicha, chief of the Cleveland Research Division, Aluminum Co. of America, presented an enlightening lecture on "Aluminum Foundry Practice." In addition to covering aluminum castings, their defects, causes and correction, much of the discussion included foundry practices in general.—*Roy A. Loder, Erie Malleable Iron Co.*

**University of Wisconsin:** Twenty members of the AFS student chapter at the University of Wisconsin, Madison, Wis., attended a meeting on Feb. 15 at which the chapter adviser, A. F. Pfeiffer, Allis-Chalmers Mfg. Co., West Allis, Wis., spoke on the importance of the patternmaker

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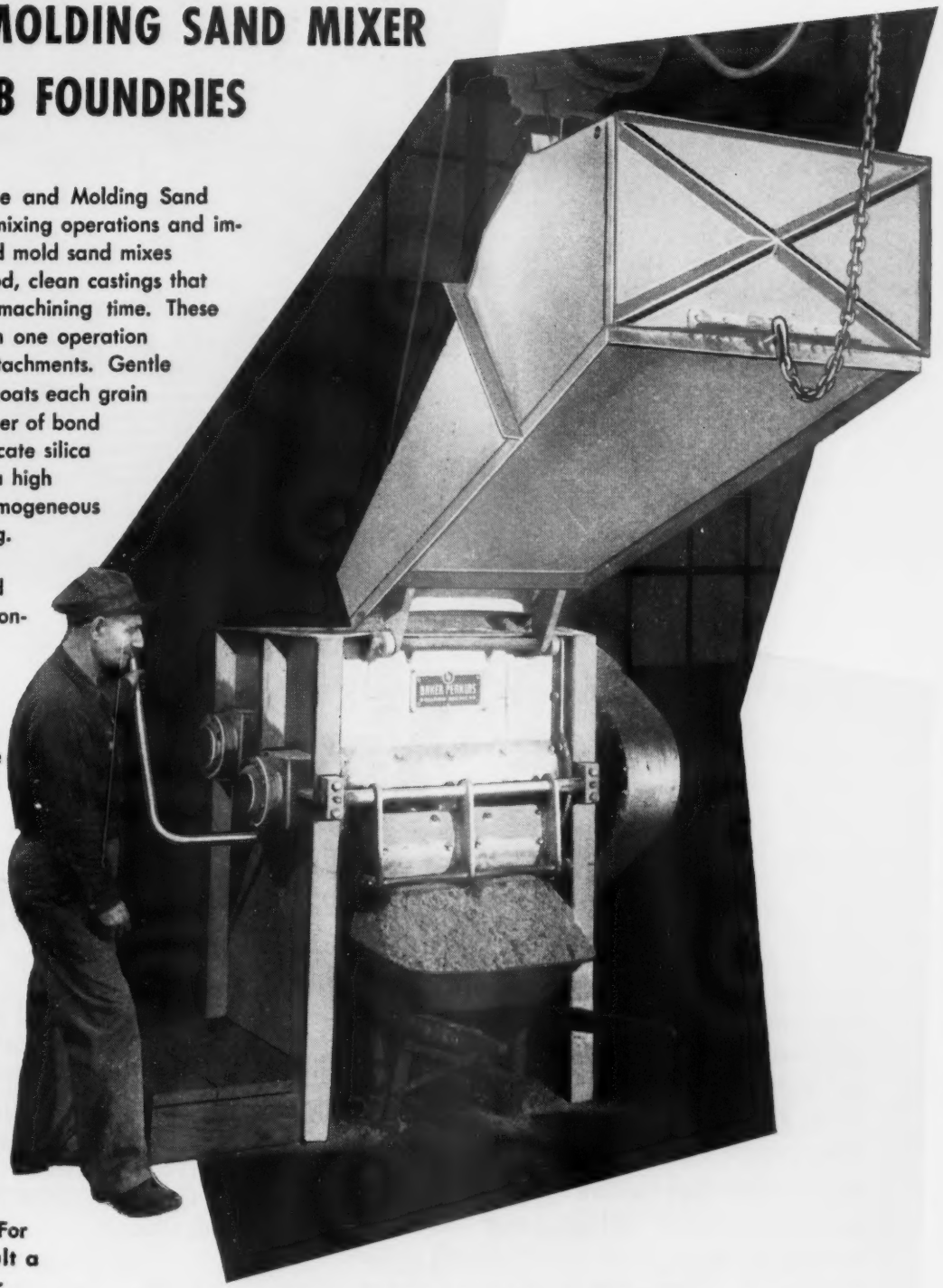
BAKER PERKINS Unidor Sand Mixers are strong and well constructed with a simplified operating mechanism that helps keep maintenance and operating costs low. The No. 14 Mixer shown here has a fabricated steel trough shell and cast iron ends, renewable steel liners, and cast steel Sigma blades with renewable wearing shoes of hardened steel. It has a working capacity of 5.5 cu. ft. BAKER PERKINS Unidor Mixers are available for job foundries in capacities up to 35 cu. ft. These models can be adapted to or equipped with air or electrically operated skip hoists. A laboratory model with a working capacity of 1500 to 2000 grams is also available. For complete information, consult a BAKER PERKINS sales engineer or write us today.



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For example: *four* forward speeds give it faster acceleration, faster "cycling", faster delivery on long hauls, better ramp operation and better traction on uneven, soft or slippery surfaces. Add to this the advantages of its large (7.50 x 16) hi-flotation drive tires, higher ground clearance, greater stability (55-inch wheelbase, 41-inch wheel tread), top forward speed of 13.88 miles per hour—and it's not hard to see why "YARDLOADER" is setting new performance records on in and out-of-doors jobs.

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in the foundry industry. He described his firm's apprenticeship training program for patternmakers. Mr. Pfeiffer showed slides to illustrate the correction of problems encountered in large patterns.—*Edwin Bremer II*

**Cleveland Non-Ferrous:** Non-Ferrous Founders' Society chapter met Jan. 27 at the Cleveland Athletic Club, Cleveland, to conduct a discussion of "Melting Fuels." Henry Apthorp, East Ohio Gas Co., talked on the advantages of fuel melting and explained the different kinds of flame acquired from fuel melting. R. J. Reed, North American Mfg. Co., presented a brief history of the burner equipment industry, showing pictures of different kinds of burners. Meeting was summarized by Al Thurston, East Ohio Gas Co.

At the February meeting, also at the Athletic Club, Walter Sicha, chief of the Cleveland Research Division, Aluminum Co. of America, was guest speaker. In his talk, entitled "Aluminum Foundry Practice," Mr. Sicha called particular attention to casting defects, illustrating with slides, porosity defects, their cause and what can be done to correct them. A. H. Hinton, manager of the Sand Cast Foundry, Cleveland Works of Alcoa, was also present, and following Mr. Sicha's talk, joined him in a question-and-answer period devoted to discussion of aluminum castings.—*Walter O. Larson Jr., Grafton Foundry Co.*

**Central Michigan:** Dr. Richard Schneidewind, professor of metallurgical engineering, University of Michigan, was guest speaker at the February meeting of the AFS chapter, at Hart Hotel, Battle Creek, Mich. He discussed the use of the injection process in molten iron and the many physical properties that can be obtained economically, using this procedure.—*Lewis Heisler, Gale Mfg. Co.*

**Northern California:** Regular monthly meeting of the AFS chapter was held Feb. 14 at Hotel Shattuck, Berkeley, Calif. Warner B. Bishop, sales manager, Foundry Products Division, Archer-Daniels-Midland Co., Cleveland, presented an illustrated talk entitled "Common Sense in Cores," which was well received by those present.—*J. M. Snyder, Joseph Musto Sons-Keenan Co.*

**Ohio State:** February meeting of the AFS student chapter was held in conjunction with the regular meeting of the Central Ohio Chapter. On Mar. 2 the chapter held its regular monthly meeting, in the Industrial Engineering Bldg., on the campus at

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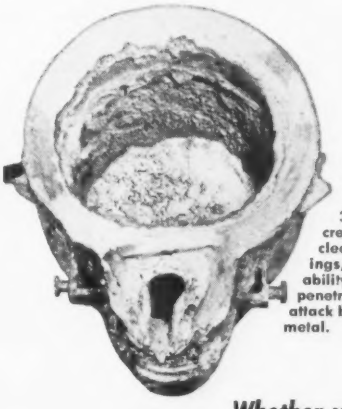

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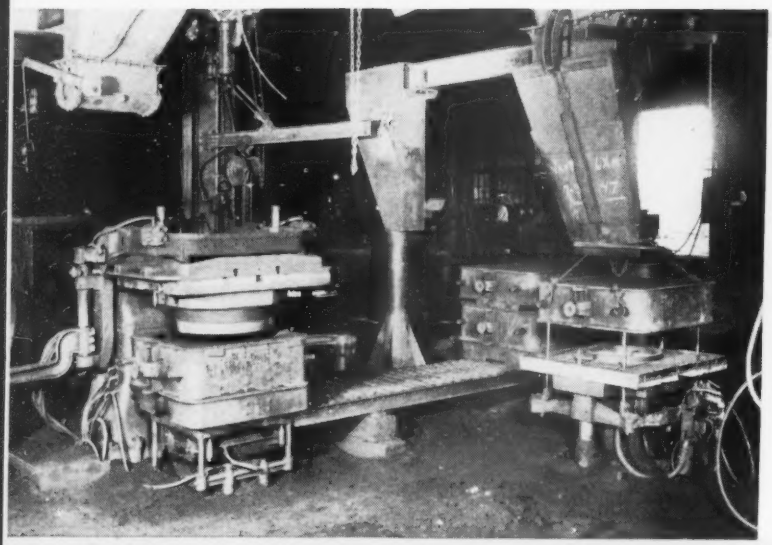
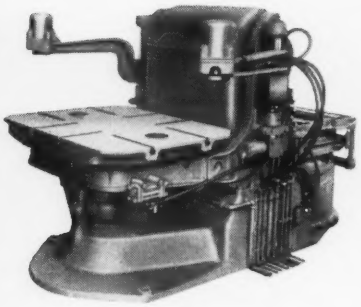
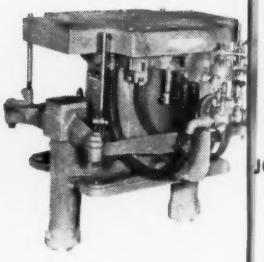


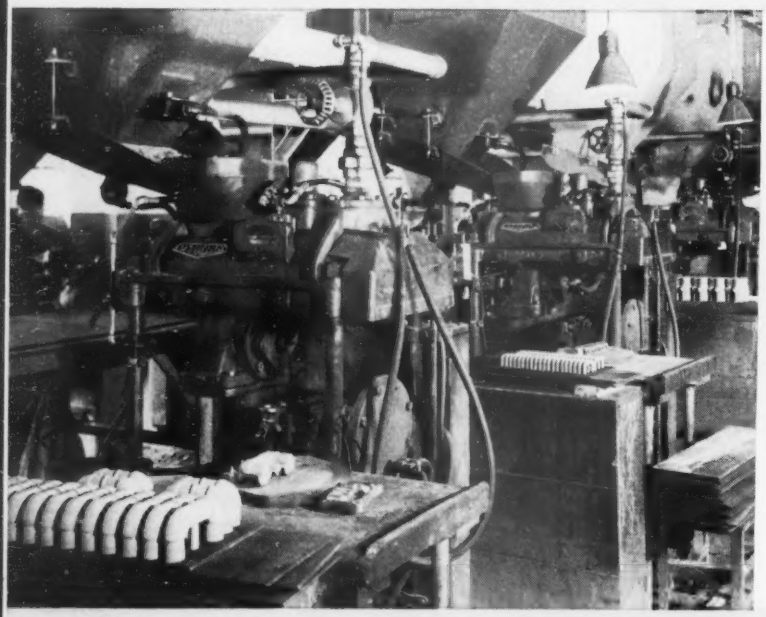
**Osborn No. 643** Jolt Rockover Draw (left) makes drags.
**Osborn No. 540** Jolt Stripper (right) makes copes.



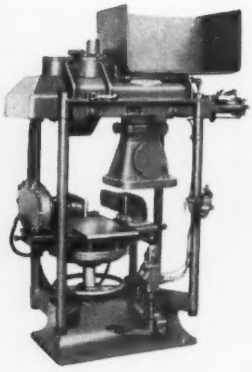
JOLT ROCKOVERS



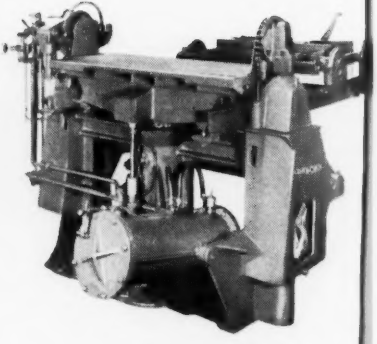
JOLT STRIPPERS



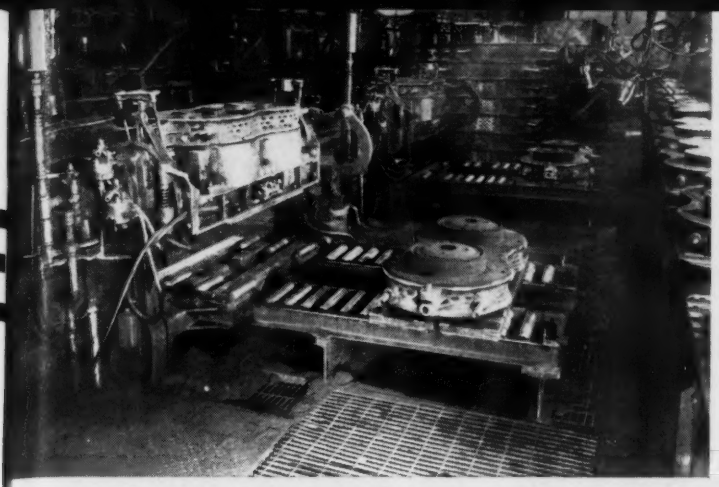
**Osborn Diaphragm type** core blower with automatic controls producing cores for pipe fitting molds.



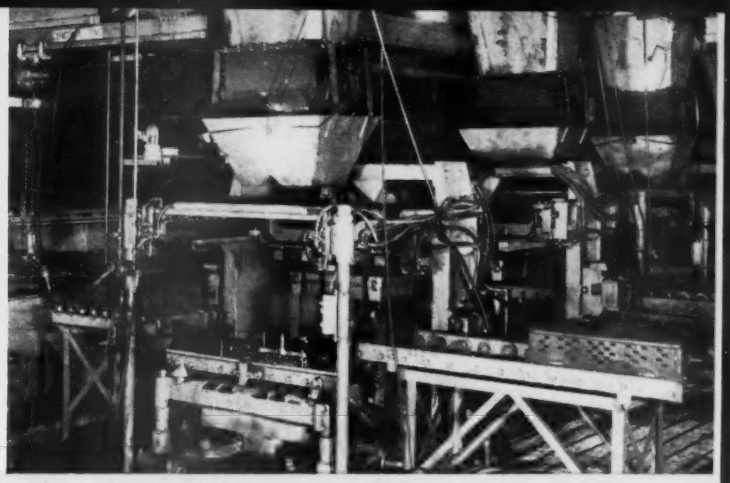
CORE BLOWERS



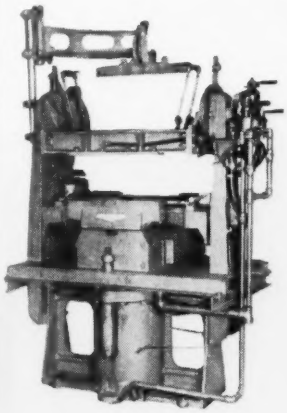
JOLT ROLLOVERS



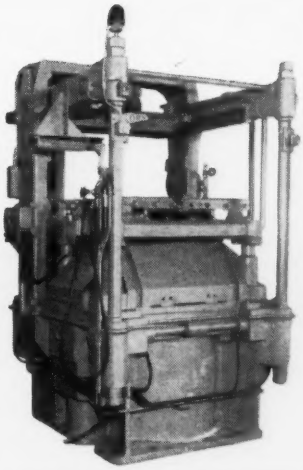
**Osborn No. 333** Jolt Rollover Squeeze making large drag molds.



**Osborn No. 1230** Jolt Squeeze Strippers making drags and copes for automotive cylinder heads.



JOLT ROLLOVER SQUEEZERS



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Osborn machines are also available with automatic controls for higher production requirements. Information on any Osborn molding machine or core blower is available by writing The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio.

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**Osborn Jolt Squeeze** molding machines are available with wheels or pedestal base.

Columbus, O. Bert Claeboe, North American Aviation Corp., Columbus, gave an interesting talk on "Patent Problems for Engineers."—*W. Fred Clutton*

**Chicago:** By combining its regular meeting on Mar. 7 with the start of its educational course on "Molding Methods for 1955," Chicago Chapter, AFS, attracted a record audience of nearly 400 members and guests. This session, conducted at the Chicago Bar Association, was devoted to "Blow Squeeze Molding".

Chapter President Robert L. Doelman, sales engineer, Miller & Co., presided at the business portion of the meeting. He introduced National Vice President Bruce L. Simpson, president, National Engineering Co., Chicago, who asked for a large attendance at the annual convention in Houston in May.

The "Blow Squeeze Molding" session was chairmanned by Ed Jory, Lester B. Knight & Associates Inc. The subject was presented jointly by Bruce Allen, operating and sales department, and Dr. Frank B. Rote, technical director, Albion Malleable Iron Co., Albion, Mich. Mr. Allen showed a movie describing the Albion Malleable Iron Co. operation and Dr. Rote discussed technical details.

Roundtable sessions are scheduled for the April 4 meeting of the chapter. Subjects and speakers are: "Characteristics and Production of Pearlitic Malleable and Ductile Irons, by Lyle Jenkins, metallurgist, Wagner Malleable Iron Co., Decatur, Ill., "Patterns for the Atomic Age", by Carl J. Johnson, superintendent, Western Foundry Division, Consolidated Foundries, Holland, Mich., "Natural or Synthetic Sands", by George W. Anselman, Foundry Services, Rockton, Ill., and "Electric Furnace Operation and Maintenance", by Samuel Arnold III and George D. Lawrence, respectively, consultant and assistant contracting manager, electric furnaces, American Bridge Co., Pittsburgh—*Erle F. Ross.*

**Saginaw Valley:** Approximately 275 members and guests attended the annual Ladies' Night meeting of the AFS chapter, held Feb. 3 in Frankenmuth, Mich. Dr. Llewellyn Heard, research chemist, Standard Oil Co., offered an interesting illustrated lecture on "Fire Magic," punctuating the talk with smoke rings, green flames and other experiments. — *Nicholas Sheptak, Dow Chemical Co.*


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## ASTM Issues Fatigue Data

Leading experts on metal fatigue of the American Society for Testing Materials have prepared a list of references to articles published in 1953 dealing with fatigue. These references have been published as ASTM special technical publication 9-E, *References On Fatigue* (1953). About 250 references plus abstracts when available make up the 34-page publication. Copies can be ordered from ASTM, 1916 Race St., Philadelphia 3. Price is $1.85.

## Cost Booklet Is Published By Metal Treating Institute

A basic cost accounting system for heat treating operations is given in a 16-page booklet, "Cost Accounting for Heat Treating," published by the Metal Treating Institute, 271 North Ave., New Rochelle, N. Y. Subjects considered include the determination of expenses, allocation of expenses, determination of unit costs and application of unit costs. The booklet may be obtained from the institute, at address given above.

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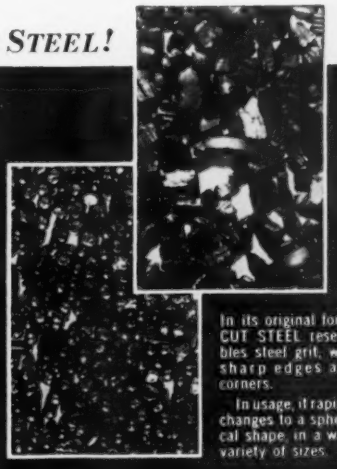

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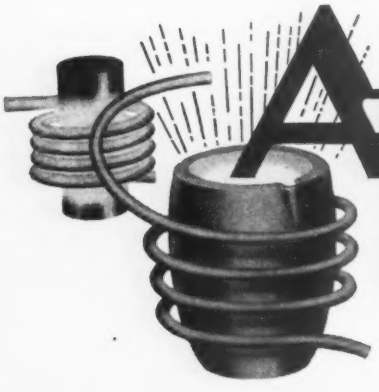
Economy recommends it, progress demands it; induction melting is fundamental to modern precision foundry work. Write for Bulletin 27-B . . . Ajax Electrothermic Corp., Trenton 5, New Jersey.

*Associated Companies:* Ajax Electric Company—Ajax Electric Furnace Co.—Ajax Engineering Corp.



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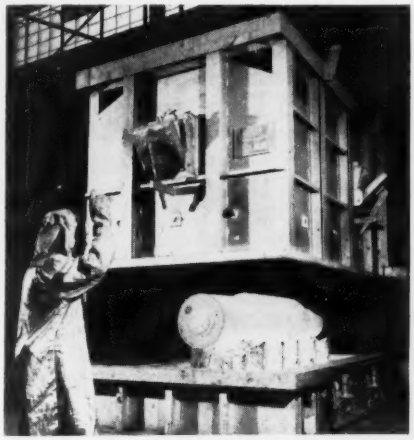
# Gray Iron Rolls Receive Individual Heat Treatment

### *Cycle Regulation Permits Close Control of Work*

MORE than a century of roll making has been marked by continuing progress in developing new techniques for molding, casting, heat treating and metal composition, yet metallurgists continue to find ways to improve this fundamental steel forming tool.

Six major factors determine the life which can be expected from any roll. They are metallic composition, molding practice, melting practice, feed of metal to the mold, heat treatment and the conditions under which the roll is to be used.

One of the newer developments in heat treating of rolls is being used



at Blaw-Knox Co., Pittsburgh. There, new cycle-regulating furnaces have replaced open-pit type furnaces. The new furnaces enable each roll to be heat treated individually to customer specifications. A charting unit for each furnace records time and temperature changes which can be checked against original specifications.

In these furnaces, as shown in the accompanying illustration, each roll is given individualized treatment, tailor made for the job it is to perform. Treatments include annealing, normalizing, quenching and tempering, and often combination practices.

In the annealing process the as-cast structure of the roll is modified to a finer grain, and since the rate of cooling is slow, the process provides minimum hardness.

Normalizing, a faster rate of cooling for a roll, increases the hardness, tensile strength and yield strength with only slight modifica-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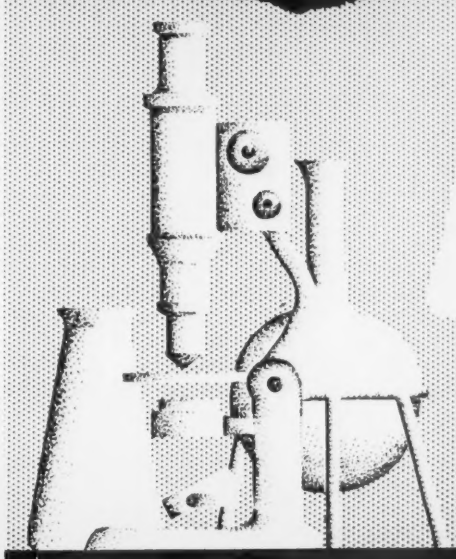

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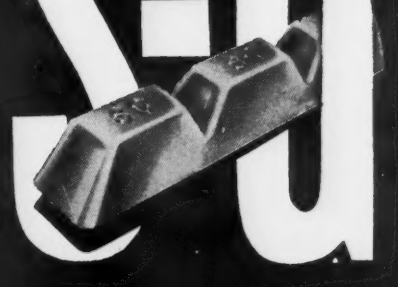

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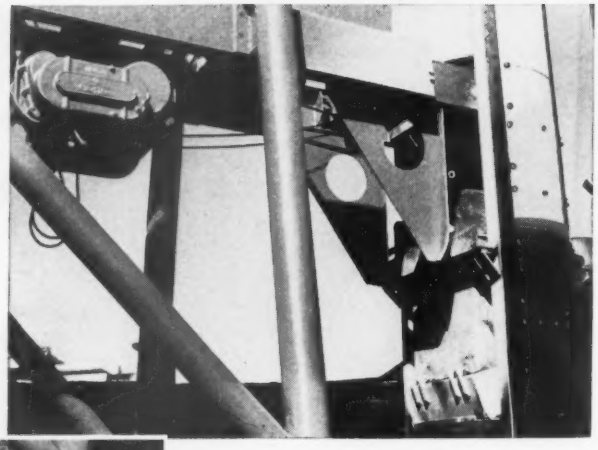
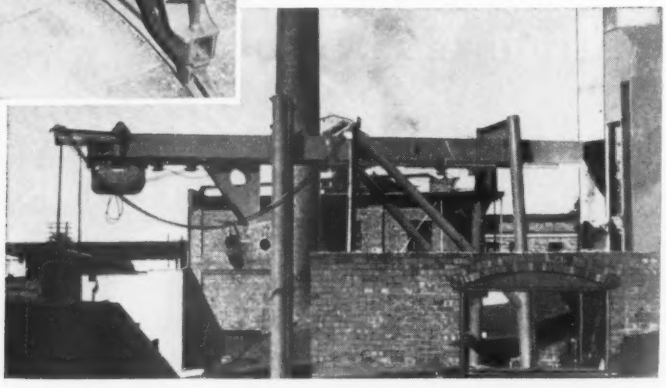


Three views of the Columbiana Automatic Cupola Charger: Top shows close-up of machine; left shows its mobile base; bottom shows complete setup.



The Columbiana Automatic Cupola Charger shown is capable of placing 1000-lb. charges every 1½ minutes. The machine is entirely automatic, but its movements may be controlled by an operator. Services of only two men are required for weighing and placing the charge in the charging bucket. A single control button starts the automatic cycle that lifts the load vertically 25 feet, then carries it horizontally into the cupola, where the bucket is lowered and discharged, after which it returns automatically. This machine is entirely new, but the manufacturers have several sizes available. Call or write:

**MACHINE DIVISION**

**OF**

**THE COLUMBIANA PUMP CO., COLUMBIANA, OHIO**


tion of the roll's ductility as compared with the annealed state. This process is used especially in treating larger rolls.

Higher temperatures are used in annealing. The time may vary, depending upon roll size, from one week for single annealing to 20 days for special hardness treatments.

Degrees of quenching include air blast, water spray and full water The faster the cooling, the harder the roll. Techniques also have been developed for differential cooling so that a hard body may be combined with ductile and shock resisting necks.

## GIFS Group Meets in Chicago

The Chicago Management Group of the Gray Iron Founders Society held its quarterly meeting at Navy Pier Branch, University of Illinois, Chicago, on Jan. 17. Hosts to the group were Fred W. Trezise, associate dean of engineering, and Prof. Roy W. Schroeder, pattern and foundry laboratory.

A feature of the program was a demonstration of the electric melting furnace equipped with hydraulic arc control developed by the Whiting Corp., Harvey, Ill. Operation of the control was described by W. A. Morey, director of research, of the latter company.

John M. Gajentan Jr., vice president, Chicago Foundry Co., and president of the management group, presided at the meeting.

## Battelle Describes Research

How problems in research and development are solved is described in an illustrated booklet of Battelle Memorial Institute, 505 King Ave., Columbus 1, O. Information is given on research as a factor in modern business, contact research and the facilities and equipment used at the institute. A listing of fields of research and the procedure for initiating research are included.

## Ford Plant Wins Safety Award

Employees of the Cleveland Foundry, Ford Motor Co., have earned the National Safety Council's "Award of Merit." This award is presented to plants working in excess of 1 million man-hours without a lost-time accident for a period longer than 30 days. Ford foundry employees more than doubled this requirement by working over 2 million man-hours without a lost-time accident.

Radiograph reveals several sand inclusions. These must be chipped out and repaired.

Later radiograph shows repairs have made the casting sound—saved the cost of re-casting.

# RADIOGRAPHY

## teams with Foundry know-how

## *to produce a sound high pressure valve body*

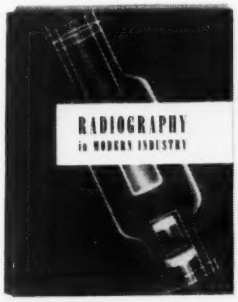
TO TAKE its place in a 300 psi system, this steel valve casting had to be sound. So, it was checked by radiography, revealing the presence of sand inclusions. These were chipped out and the necessary repairs made—a second radiograph showed a sound, homogeneous casting.

This is another good example of the way radiography is used to insure good work, avoid waste, and prevent service failures. It's another example of the way it can improve operations and increase business.

Perhaps you, too, can do this through the use of radiography. Talk to your x-ray dealer. Send for a free copy of "Radiography as a Foundry Tool."

## *RADIOGRAPHY*

***another important example of photography at work***

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**EASTMAN KODAK COMPANY**
**X-Ray Division**
**Rochester 4, N.Y.**

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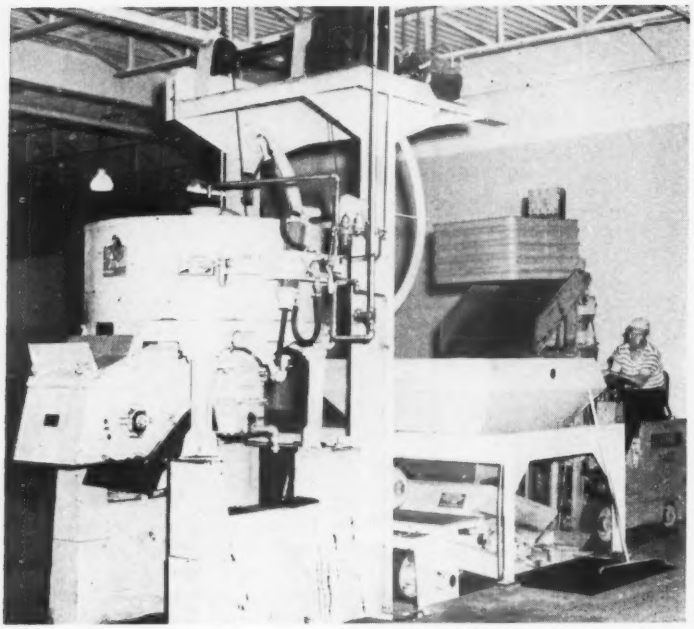


Fig. 1 (above)—Sand conditioner, in junction of members of the T-shaped foundry, is supplied by fork lift truck

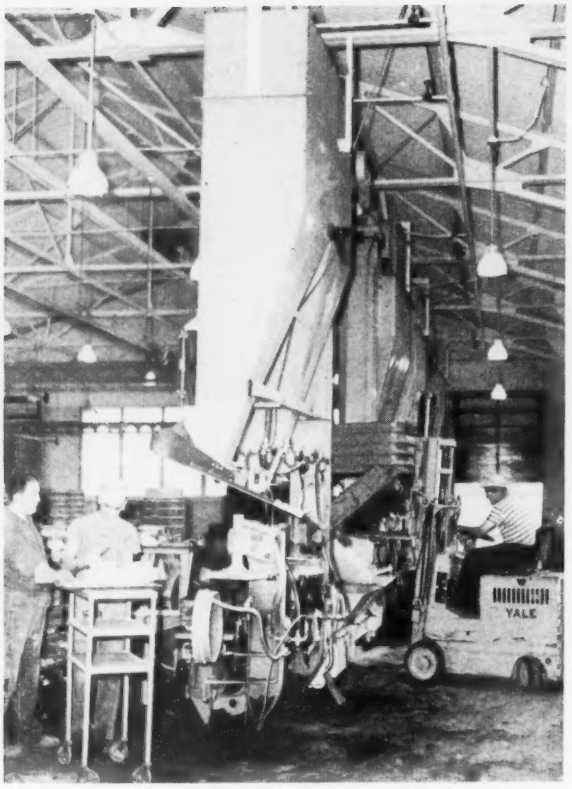



Fig. 2 (right)—Fork lift truck also services the molding machines, which are backed up by an aisle 10 ft wide

## *Doubles Capacity . . .*
## *Cuts Costs in . . .*

# NEW NONFERROUS FOUNDRY

By WALTER RUDOLPH

NEW facilities have doubled capacity and reduced labor costs in the nonferrous foundry of American Sterilizer Co., Erie, Pa., producer of hospital equipment. The firm's new foundry is estimated to be capable of producing 2 million lb of aluminum and copper-base alloy castings annually.

Now gradually being evacuated, the entire old plant, including the foundry, has become cramped by expansion over the years. All phases of the operation have been improved in the new setup, resulting in better working conditions as well as increased manufacturing efficiency and volume. Because castings range in weight from a few ounces to 400 lb, the foundry is only semimechanized. About 15 per cent of the total tonnage is cast in aluminum, in four different alloys, and production in this metal is increasing.

Working floor area in the new foundry is about 22,000 sq ft, roughly T-shaped, with the left side of the cross-arm longer than the right. Metal and sand receiving and storage are in the right arm, adjacent to the furnace room. The molding room forms the vertical member of the T. At the end of the molding room, next to the cross-arm of the T, a 40-ft area has been allotted to experimental and developmental work, with two floor molders.

Furnaces are of the pit-crucible type, in two rows of seven each. They

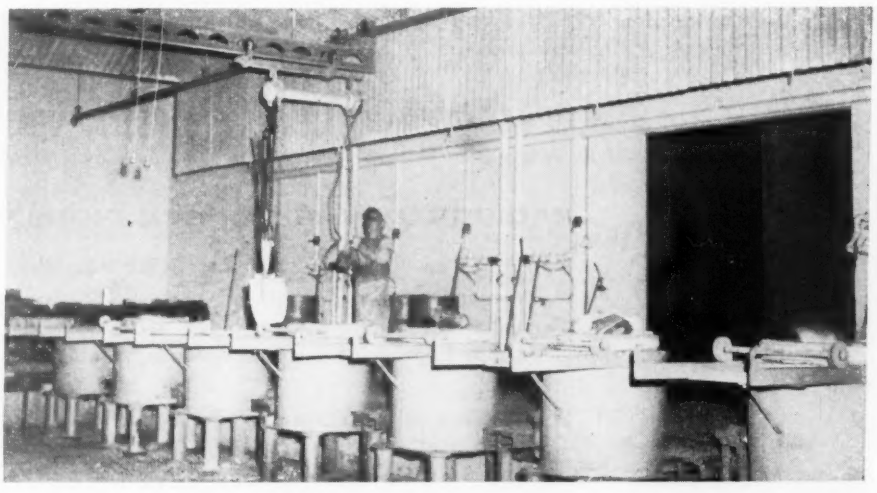


Fig. 3—Furnaces are of the crucible type, in two rows of seven each. Three blowers over the area exhaust fumes at the rate of 180,000 cfm

Fig. 4—Mobile racks are pushed into the core oven, location of which is near center of T

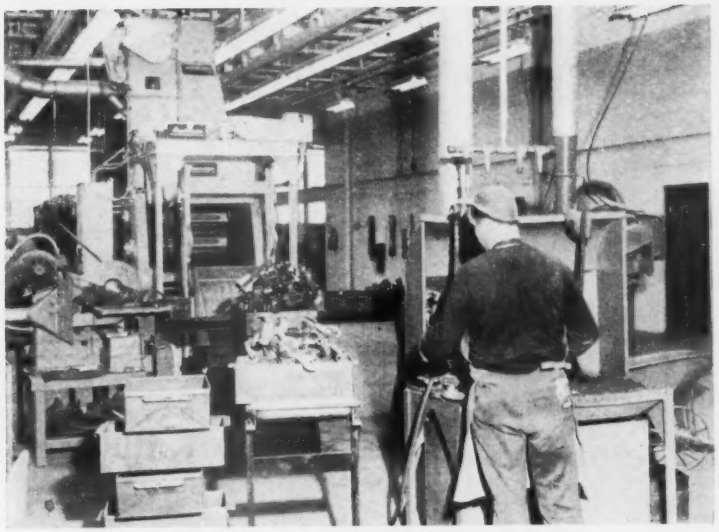


Fig. 5—Cleaning of castings begins here, then moves to cutoff saws, cleaning, grinding and finally to storage

incorporate dual gas and oil burners, oil being used as standby fuel. Three blowers create a canopy effect over the furnace area and exhaust fumes at the rate of 180,000 cfm. Metal temperature is checked with both recording and portable hand pyrometers.

Molds are poured and shaken out in the same area where molding is done. Crucibles are removed from furnaces with a chain hoist and transferred to a modern pouring device mounted on a continuous, overhead monorail conveyor for movement to the molding room. Transfer points in the system permit movement of crucibles down the 120-ft molding-pouring area and into any of three pouring sections on individual bridge cranes. These cranes can traverse the sections over the flasks, which rest on conventional, knee-high roller conveyor lines.

At the end opposite where the crucibles are transferred from the monorail, the roller conveyor lines extend from each of eight molding stations, including five squeezers and three benches. Sand is conditioned in a unit at the junction of the cross-arm and the vertical member of the T. The company currently uses natural sand, but expects to go to synthetic. Fork trucks transport sand in dump boxes to the molding stations where it is elevated into individual sand bins. The same trucks move castings from shakeout to cleaning and storage areas. Ten-foot aisles along both sides of the pouring-molding room expedite this materials handling with minimum danger of traffic accidents.

The remaining section of the foundry comprises the larger (left) side of the cross-bar of the T. Located here are cleaning area, casting storage, coreroom, patternshop, washrooms, foundry superintendent's office, a sand laboratory and, on a second-floor area, pattern storage and a ladies' room.

Fig. 6—Crucibles are removed from furnaces by chain hoist for pouring and are transferred to pouring device on an overhead monorail conveyor

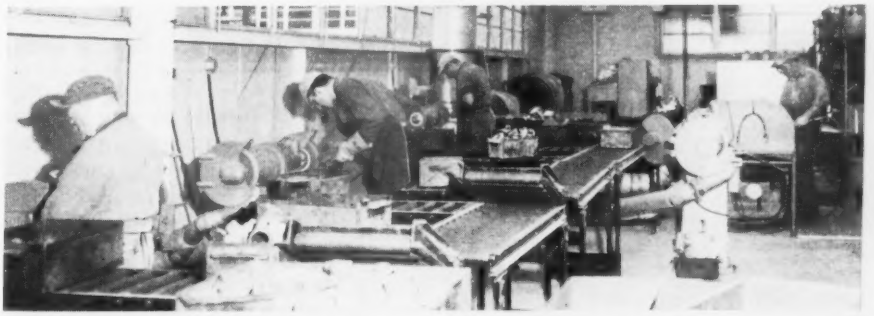
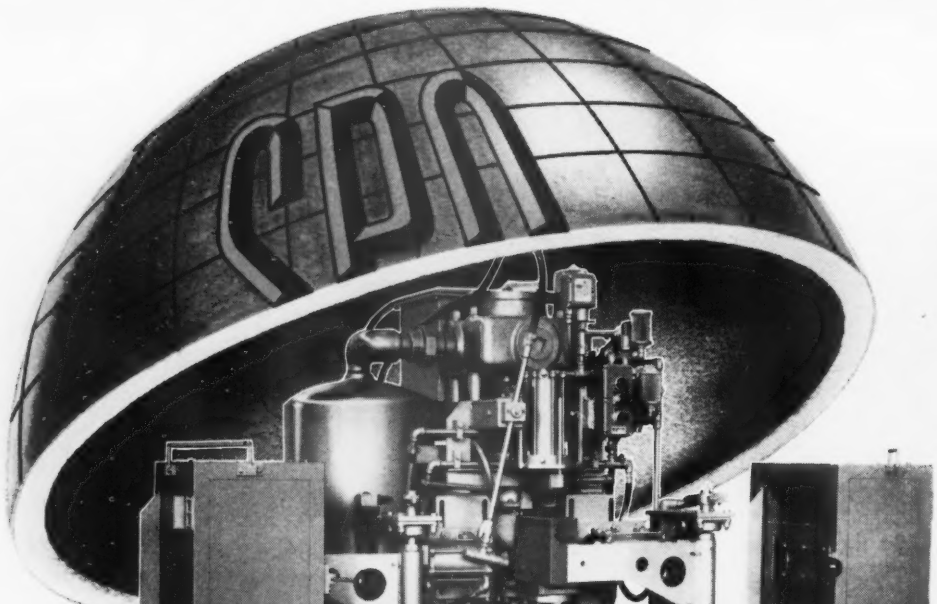


Fig. 7—When castings have finished their movement through the cleaning area, shown here, they move to storage in the left side of crossbar of T

Workers' comfort is stressed. The ceiling and the upper portions of the walls of the foundry are painted white. Equipment is light yellows and greens. Lighting is brilliant throughout.

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Here's another first by SPO to open new horizons in precision molding... a machine designed to produce uniform standard *hollow cores.* These hollow cores assure closer tolerances... eliminate venting problems... permit faster and easier core shake-out. They also require less curing time... can be made faster.

The new SPO Model 10 Hollow Core Machine makes finished cores in a 45-second cycle without the use of separate dryers or core ovens. All operations except positioning of coreboxes and core removal are automatic. In addition, absolute accuracy of finished cores is assured because they are not removed from box or handled until cured and ready to use.

A two-station machine requiring only one operator, Model 10 can be installed in molding machine lines to speed up production. This versatile machine combines simplicity of operation with famous SPO accuracy and dependability to give new precision and economy in core production and finished castings.

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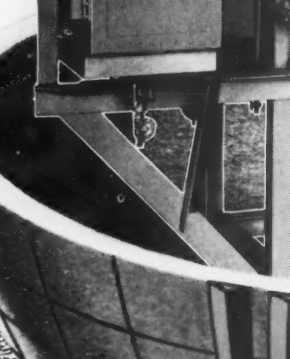

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# AROUND THE COUNTRY

NEWS REPORTS FROM

Philadelphia
New York
Chicago
Los Angeles
Detroit

***New York***— Business in castings is spotty; and while better than at the beginning of the year it is far from brisk and generally disappointing to foundrymen.

Gray iron operations average around four days a week and also with somewhat restricted working forces. Building needs are active but machinery reqirements still lag and to date gray iron shops have not reflected the pickup that might be expected in view of the current high rate of operations in the steel industry. Some say that this is just a matter of time, however.

Steel and malleable casting shops, especially the latter, are doing fairly well. Operations are estimated at around 75 to 80 per cent of normal and reflect some pickup in capital goods requirements.

Brass foundries report definite improvement. Captive shops producing meters, pumps, valves and various plumbing items, are generally busy, with independents beginning to get a greater overflow of this work. Specialties for the dairy industry, involving special alloys, are coming out more freely. There is a gain in ship propeller work, and, interestingly, some of this business is coming in from abroad, despite lower labor rates on the other side. There is speculation as to whether or not this foreign business can be ascribed in part to the high copper market abroad.

***Chicago***— Ferrous foundries operated at a faster clip in March and outlook for April is for still further improvement. Order books of pig iron and coke suppliers are reflecting the expansion in activity, although foundry operators continue to maintain smallest possible inventories of raw materials and to place orders for replacements with little to spare in the way of lead time.

The whooping rate of automobile production continues as the principal support to gray iron and malleable foundries, both captive and jobbing. More recently there is an upturn in farm machinery output and household appliances maintain their strong position. For steel and malleable shops a pickup in construction of new freight cars and repair of old is proving timely.

Despite these encouraging developments, a number of jobbing shops find themselves not participating in the swelling volume of orders for castings. Of 10 gray iron foundries polled recently, two were running four days, or 32 hours. The eight others were operating 40 hours. Operating rates ranged from 50 to 85 per cent of capacity, with 73 per cent as the average. Backlogs of orders went from 1 week to 6 weeks with 2.75 weeks as average. For second quarter, only one regarded the business outlook as bleak. The majority look for modest improvement and a couple view the prospects as very good.

The improved demand for foundry pig iron combined with the greatly increased need for hot metal for steelmaking add up the best blast furnace operations in the Chicago district in 19 months. As of mid-March, 40 of the 43 blast furnaces were under wind. August, 1953, was the last time this many furnaces were in use.

***Los Angeles***— Foundrymen in this district have divided their attention recently between sales charts, which reflected only scattered gains, and the most recent effort of the American Foundrymen's Society to assist industry in air pollution control.

With public uproar over periodic smog attacks showing no let-up, the local chapter of AFS released a booklet, "Control of Emissions from Metal Melting Operations," compiled by the National group's Air Pollution Control Committee. The material deals with the general subject of air pollution and its control, describing the engineering characteristics of the various types of equipment now in actual service for controlling pollutants.

According to AFS officials, a prime purpose of the booklet is to give foundry operators information necessary to comply with local air pollution ordinances. "The public doesn't know how much time and money have gone into our air pollution control devices," one prominent foundryman said. "We hope this booklet and others to follow will present our case properly."

Businesswise, steel castings demand is described as steady but not brisk, although all shops in this district are working a five-day week with full working forces. Light metal shops engaged in aircraft production are the busiest.

***Detroit***— The General Motors Corp. Technical Center at Warren, Mich., near Detroit is a Walt Disney Tomorrowland in appearance and in the work of its personnel whose mission is to explore the future. Nearing completion are 25 ultra modern glass, steel and colorful, glazed masonry buildings grouped on a beautifully landscaped site of 320 acres.

More than 3500 engineers, researchers, stylists, designers, mechanics, machinists and other specialists will have free rein for development work within four technical sections:

*Research Laboratories Division*— Handles long-range projects in the mechanical arts and basic sciences: Chemistry, metallurgy, physics, electronics.

*Engineering Staff*—Operates service facilities for various GM divisions and specializes in development work on automotive engines, suspensions, automatic transmissions, body structures, ordnance vehicles and other vehicle components.

*Process Development Section* — Works on engineering studies and experimental projects to improve manufacturing techniques and processes for increased product quality and lower cost.

*Styling Section*—Serves as central styling and design staff with separate studios for each GM division.

The experimental foundry, part of the Process Development Section, occupies an area 120 x 240 ft in one of the buildings. It is under the supervision of Louis J. Pedicini and can produce any casting made in GM on a production basis.

One of its most noticeable features is the color scheme. Equipment is painted in bright greens, blues, yellows, grays and silver. It's a refreshing and impressive sight. And it's not just for show. Management sees production advantages in providing pleasant working environment.

The foundry is well lighted and equipped with dust collection and ventilation units. Even the windows are opened and closed automatically. The pattern shop is equipped completely for making wood patterns. However, some metalworking facili-

ties exist for making blowplates and other simple fixtures and for work on plastic patterns. Coreroom equipment includes a sand muller, overhead monorail sand distribution system, four core blowers, three roll-over draw machines and a batch-type oven.

Green sand molding is done on four jolt squeeze strip machines. A rotary shell molding machine is operating and plans call for conveyorizing the unit to complete a production loop. A shell mold blowing machine also is operating. Castings are cleaned in an airless blast tumbling machine, a table blast unit, sand blast cabinet or tumbling barrel. Pneumatic chippers and grinders also are available. An annealing furnace also is located in the cleaning area.

At present, ferrous melting is done in three electric furnaces; however, a cupola will be installed in the near future. A gas-fired crucible furnace handles aluminum melts. A complete sand laboratory is part of the foundry, but metallurgical and chemical lab facilities are available in the adjoining metallurgical department.

Molding sand handling is unique. Trucks dump new sand into a below-floor-level hopper from which it is moved by pneumatic conveyor to storage bins. Belts feed sand from the various bins back to the pneumatic pressure vessel for blowing to hoppers supplying the mullers. Hopper over the molding sand muller is unusual in that it is divided into four sections. They are filled selectively by a plate feeder. Each section can feed sand to the weigh hopper over the batch type muller. Thus sand from any four GM foundries can be segregated for experimental work. Bucket elevators, belts and plows distribute prepared sand to the molding station hoppers.

***Philadelphia***— Foundry business is slightly on the upgrade. In most categories—gray iron, steel, malleable and nonferrous—there is some betterment as compared with early in the year. Also encouraging is that pattern shops are more active than they have been for some time.

However, in ferrous castings and particularly in gray iron, business has not shown improvement over last fall, and there is still little disposition to place orders ahead.

Most activity in gray iron is for building requirements—for manholes, culverts and soil pipe. The latter, as well as pressure pipe, has slumped off seasonally but is fairly active and indications point to a pickup once weather conditions become more favorable. Paper machinery people are rather busy, and textile machinery needs are a shade better, but still dragging.

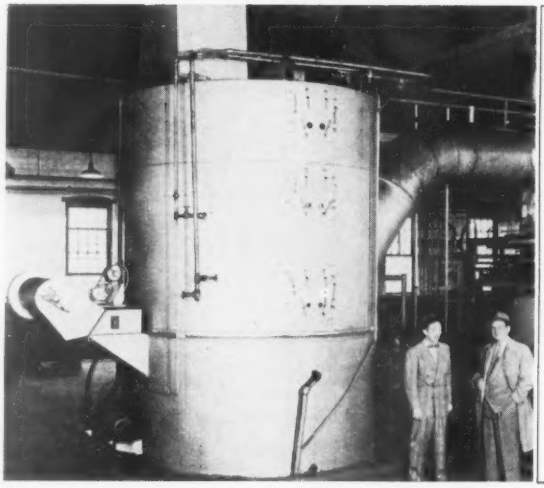
Gray iron foundries are operating four to five days a week, with reduced working forces. Some observers say that output is running 65 to 70 per cent of normal, perhaps nearer the outside figure. This is about comparable to operations last October. Order backlogs range two to three weeks.

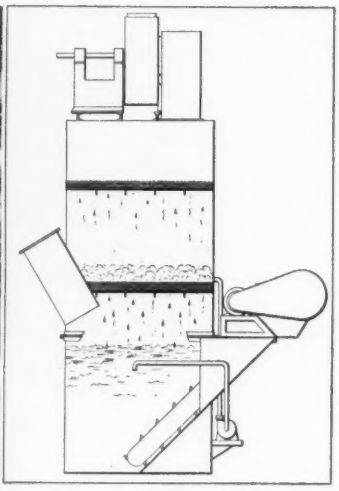
Steel casting output shows some improvement over a month ago at around 75 per cent of normal. This reflects some lift in capital goods requirements, such as motor frames, machinery housings, pumps, etc.

Malleable shops are running close to 100 per cent of normal. Pipe fittings are a major sustaining item, although agricultural equipment requirements are stepping up a bit and there is even some pick-up in railroad needs, although definitely nothing to shout about. Sellers are booked six to eight weeks ahead.

Demand for brass and bronze castings is livelier and diversified. Most of the larger shops are working five days a week; the smaller four days, on an average. Light metal shops are operating at a good rate.

## DEVELOPS NEW WET TYPE DUST COLLECTOR





A NEW wet type dust collector has been developed by the National Dust Collector Corp., 549 West Washington Blvd., Chicago 6. This recently formed organization is headed by Bruce L. Simpson, who also is president of the National Engineering Co.

Known as the Hydro-Filter, the collector employs an unusual method of achieving intimate contact between air and wash water. The inlet that draws contaminated air at normal duct velocity into the unit directs the stream against the surface of water in the settling basin. Here considerable dust is deposited. As the air rises above the settling basin it is subjected to a steady rain of water droplets. Next, the air approaches a horizontal scrubber bed consisting of many layers of glass spheres supported upon a stainless steel grating. The bed is kept saturated by a pool of water on top of it.

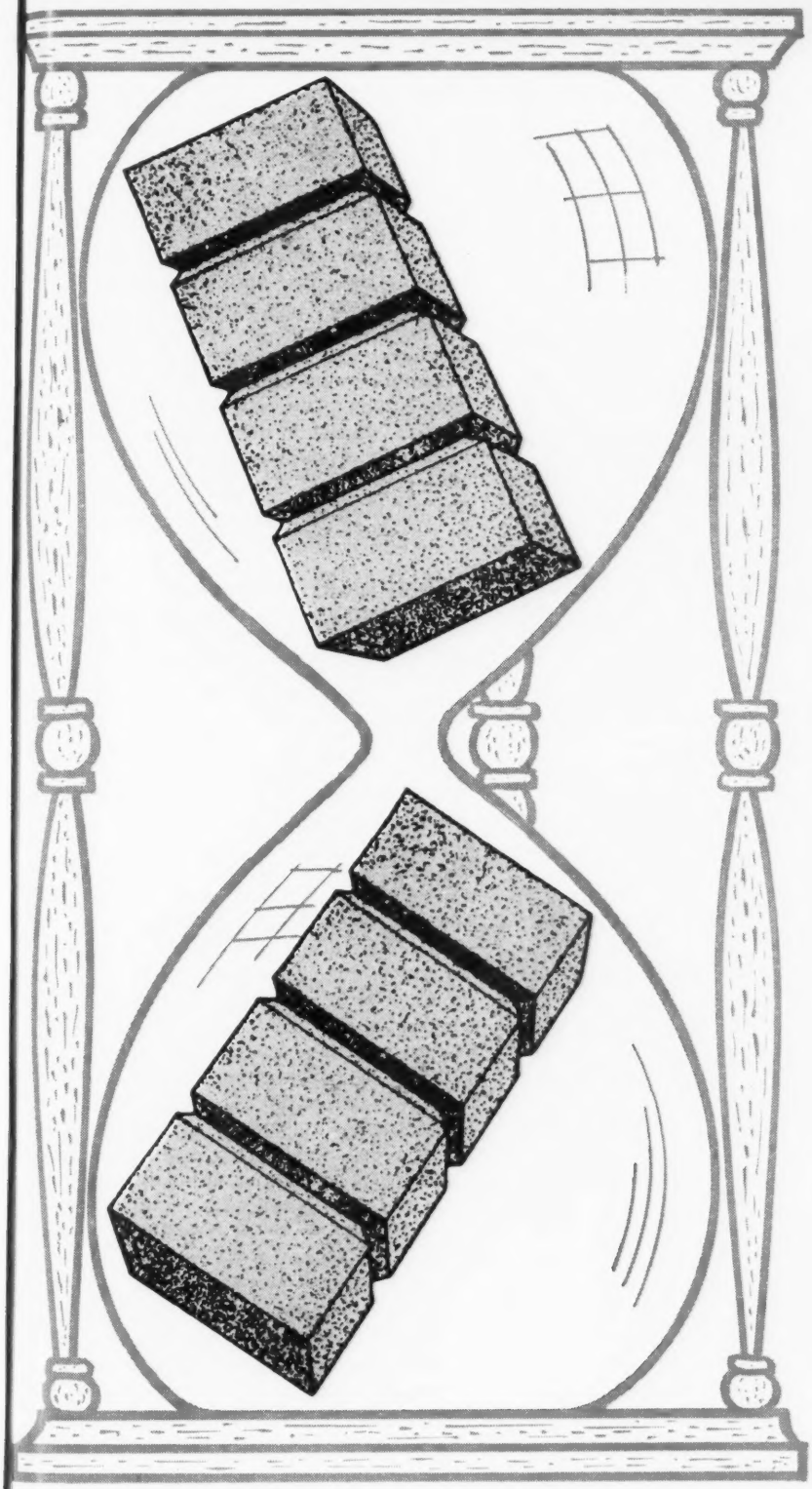
Impingement of air on wetted surfaces of the spheres removes more contaminants. As the air continues upward it is converted into small bubbles. Water is agitated violently, and air-borne dirt has ample opportunity to be wetted and absorbed. Emerging above the layer of water, the air passes through another rain of water droplets and travels through a second bed of glass spheres. Moisture in the air collects on these spheres, subsequently falling back to the turbulent layer. Cleaned and dried air passes to the scrubber outlet at the top of the unit.

A small flow of fresh makeup water, along with recirculated water from the sludge tank, is added continuously to the pool above the filter bed. Dust-entrained water steadily passes down through the bed of glass spheres and drops to the sludge tank.

Solid material at the bottom of the sludge tank is drawn out by a slowly moving chain flight conveyor and discharged into a receiver. Particles that are too light to settle out in the sludge basin are drained continuously from an overflow to the sewer or settling pond. One sludge recovery unit may serve several collectors.

The unit requires washing down only about twice a year. Corrosion and abrasion of interior steel surfaces are prevented by a heavy plastic coating. The collectors are available in a variety of sizes and types.

# *Time Proven* FAMOUS CORNELL CUPOLA FLUX



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Famous Cornell Flux is a scientifically made combination of high-grade fluorspar and many other materials which create a chemical reaction in molten iron greatly increasing slag flow off. By increasing slag flow off, Famous Cornell Flux reduces slag digging out time and practically eliminates bridging over. Once you've used Famous Cornell Flux, you'll notice the difference immediately in the improved quality of your castings.

## CALL A CORNELL FLUX ENGINEER

Ready to serve you are our engineers with long years of experience in foundries. They know your problems and they'll be on hand to help you as quickly as possible. So why not call them? Or write today for *Bulletin* 46-B.

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### Aluminum and Brass Flux

- Makes metal pure and clean.
- Permits use of more scrap without danger of dirt, porous places or spongy spots.
- Thinner, yet stronger sections can be poured.
- Metal does not cling to the dross.
- Crucible or furnace linings are kept clean and preserved.
- Cleanses molten brass even when the dirtiest brass turnings or sweepings are used.
- Saves considerable tin and other metals.
- Forms a perfect covering over the metal during melting, prevents oxidation and reduces obnoxious gases to a great extent.

**Write for Bulletin 46-A**

## *The* CLEVELAND FLUX *Company*

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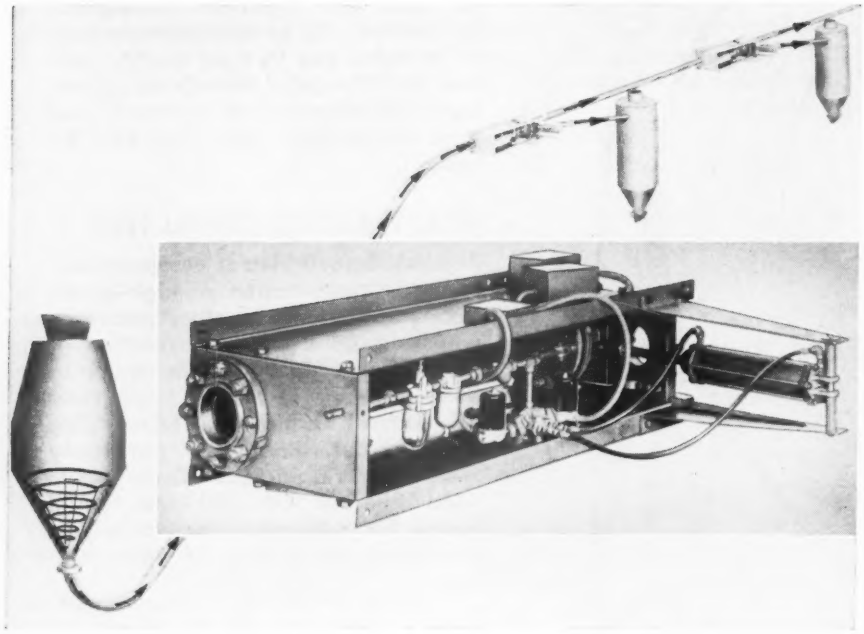
# NEW EQUIPMENT AND SUPPLIES



**Sand Conveyor:** Whirl-Air-Flow Division, Gerwin Industries Inc., Michigan City, Ind.—Pneumatic pipeline system for moving sand features three components—transporter, pipeline and transfer switch—which can be engineered into a system to meet individual foundry requirements. Sand from the muller is loaded into the transporter and the top is closed to seal the chamber. Manifolds admit air into the chamber and renewable jets distribute the air to drive the sand into the pipeline. Pipeline transports the sand throughout the foundry through 4-in. pipe, driven by compressed air. Transfer switches make possible take-off points for sand delivery to sand hoppers located at strategic spots in the foundry or coreroom.

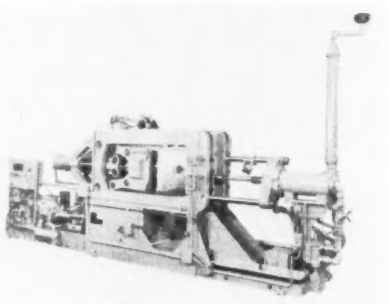
Switch is operated by a power cylinder and positioning cams, with limiting microswitches for indicating direction of flow. One man can operate the entire system by push-button control from a central panel.

For More Details Circle No. 1—Page 221

**Chart Identification:** Royson Engineering, Hatboro, Pa.—Compact device automatically prints a number, date or time on a strip chart and similar recorder charts at any instant when a voltage is applied to the device during process, test and control work. The unit makes it easy to identify individual sections of recording charts in relation to particular conditions taking place at a remote point. It is mounted on the outside of the door of the recorder and does not interfere with or obscure the recording procedure.

For More Details Circle No. 2—Page 221

**Diecasting Machine:** Lester-Phoenix Inc., 2711 Church Ave., Dept. N-14, Cleveland 13, O.—Up to 16 lb of aluminum and proportionate weights of magnesium or brass are



cast by a new 600-ton diecasting machine. In shop assembly the machine provides 33,200 psi maximum pressure on metal. Both shot speed and pressure are adjustable, with a nitrogen accumulator giving high-speed injection. Angled support bars of the injection system simplify metal pouring. Plunger tip is water cooled to prevent binding. Die opening is 14 in.

For More Details Circle No. 3—Page 221

**Mineral Shot:** Baldwin-Hill Co., 500 Breunig Ave., Trenton 2, N. J.—Nonmetallic, dustless blast cleaning agent is claimed to reduce cleaning time. Material can be reclaimed and reprocessed for use again. Spherical in shape, the mineral shot is said to clean in one pass while leaving surface free of grime, film and dust. Shot is chemically inert in the presence of moisture and will not discolor metallic or nonmetallic surfaces. Two types are available, one for heavy duty in foundries, metalworking shops and general blast cleaning and the other for fine finish on precision metal parts. Can be shipped in bulk or in 100-lb multiwall paper bags, suitable for limited outdoor storage.

For More Details Circle No. 4—Page 221

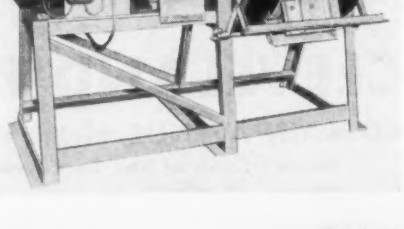
**Shell Mold Release:** Hadley Bros.-Uhl Co., 514 Calvary Ave., St. Louis 15, Mo.—New shell mold release, reportedly a time and money saver, is available for immediate shipment in 1, 5, and 50 gallon lots.

For More Details Circle No. 5—Page 221

**Solvent:** Enthone Inc., 442 Elm St., New Haven, Conn.—Powder reportedly speeds the action of acids for dissolving defective chromium and nickel from copper-base metals without injuring the base metals. Product is furnished as a dry powder for adding to certain acids to increase the dissolution rate of the acids on nickel and chromium. Manufacturer states that whereas acid without the powder may dissolve the nickel or chromium in a matter of hours, the addition of the powder enables dissolving of the coatings in a matter of seconds or minutes—and without harm to the base metal.

For More Details Circle No. 6—Page 221

**Sand Mixer:** McLanahan & Stone Corp., Hollidaysburg, Pa.—Self-contained, sand mixer has a 5-cu-ft capacity and reportedly completes the mixing process in three minutes. Mixing box is lined with replaceable high-carbon plates. Mixing is done



For More Details on These Items
Use Reply Card—Page 221

by four flanged paddle arms holding mixer blades. Batch is discharged by a hand-operated lever. Features include 3-hp gear motor, flexible coupling between motor and mixing shaft, self-aligning roller bearings, pushbutton control, and renewable felt packing for mixer shaft. Dimensions include a height of 58 in., width 36 in., overall length 8 ft, height for charging 50 in., and 32 x 36 in. mixer box.

For More Details Circle No. 7—Page 221

**Motorized Wheelbarrow:** Worthington Mower Co., Stroudsburg, Pa.—Wheelbarrow with 400-lb capacity is powered by a four-cycle, 2½-hp motor and is practical for

movement of pig iron, scrap, sand, patterns or castings. Throttle and clutch controls are on the wheelbarrow handles. Speed can be maintained at a walking pace. Semipneumatic drive wheels have thick tractor-type tread. Rear caster wheel permits easy spotting and maneuverability. Load is dumped by pulling a catch and lifting on a handle at the rear of the tray.

For More Details Circle No. 8—Page 221

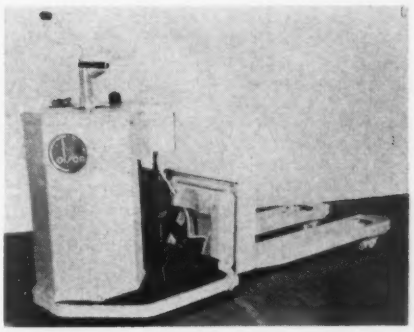
**Pushbuttons:** Westinghouse Electric Corp., P.O. Box 2099, Pittsburg 30, Pa.—Three new accessories for pushbuttons now are available. Flexible neoprene caps attach over pushbuttons to provide trouble-free operation when covered with ice or snow. A selective pushbutton makes a more compact unit, and a lever operator for two-unit pushbutton stations permits precise operation even when gloves are worn.

For More Details Circle No. 9—Page 221

**Steel Type:** Pryor Machine Co., 3244 West 30th St., Chicago 23, Ill.—Interchangeable tool steel marking type is hand finished and hardened to withstand shock usage. Each piece is Rockwell tested and anodic etched and plated. Type holders have replaceable steel inserts for type to bear against. A variety of styles to fit presses and marking machines as well as for hand use are available. Sets contain 100 assorted letters. Range of seven sizes can be supplied: 1/32, 1/16, 3/32, 1/8, 3/16, 1/4 and 3/8-in.

For More Details Circle No. 10—Page 221

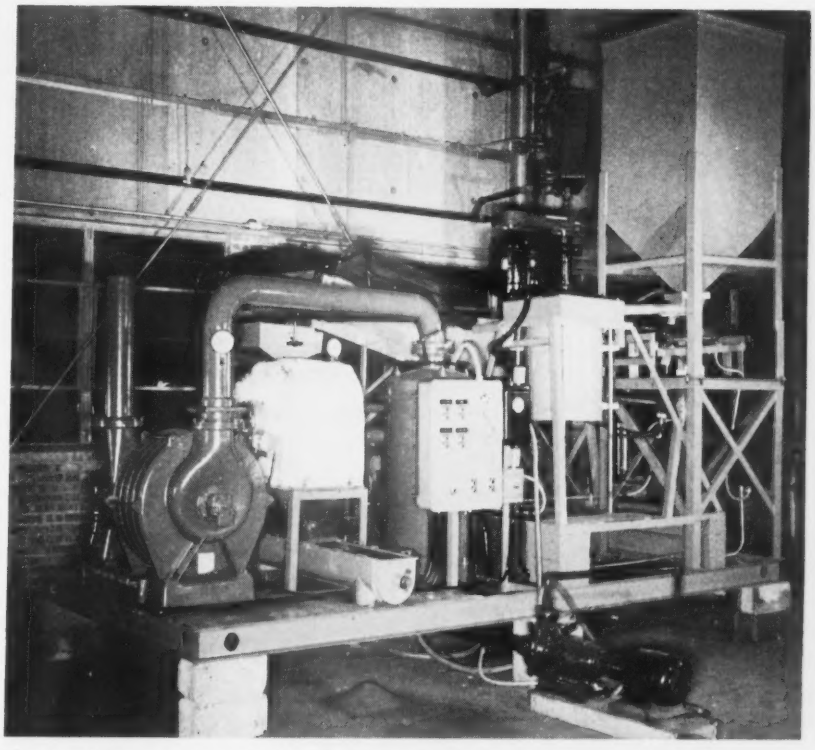
**Pallet Truck:** Colson Corp., Elyria, O.—Rider-type pallet truck is controlled by a single lever and has two speeds forward and two speeds reverse. Shifting from low to high and high to low is automatic. Pallets are lifted by raising control lever. Brakes apply automatically when operator releases control handle. Capacity is 4000 lb. Speeds up to 4 mph are possible. Steering arc is 200 degrees. Standard fork lengths are 32, 36, 40, 42, 48, 54 and 60 in.



Forks are 9¼ in. wide with an 8½ in. space between them. Width of truck unit is 29 in. and length is 30 in.

For More Details Circle No. 11—Page 221

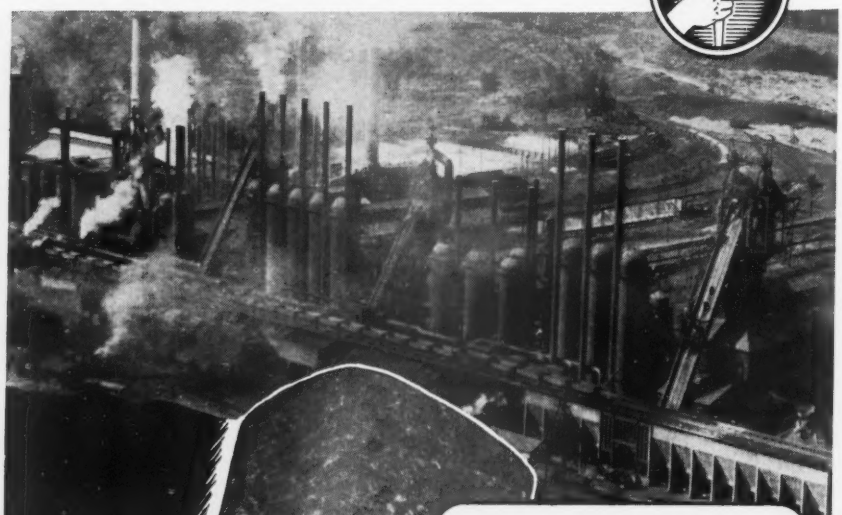
**Safety Spout:** Electro Refractories & Abrasives Corp., Buffalo, N. Y.—New safety spout that will not break away from crucibles dur-



COMPANY has added "packaged" wet sand reclamation systems to its complete line of larger units engineered to specific applications. Self-contained units with capacities of 1, 2 and 3 tons per hour are available and are said to yield a product at least equivalent to new sand. They reportedly cut space requirements, erection time and water, power and fuel consumption and require comparatively little operator attention. The unit shown here is the 1-ton-per-hour model. Manufacturer is Elmco Corp., 301 South Hicks Rd., Palatine, Ill.

For More Details Circle No. 12—Page 221

# WOODWARD PIG IRON



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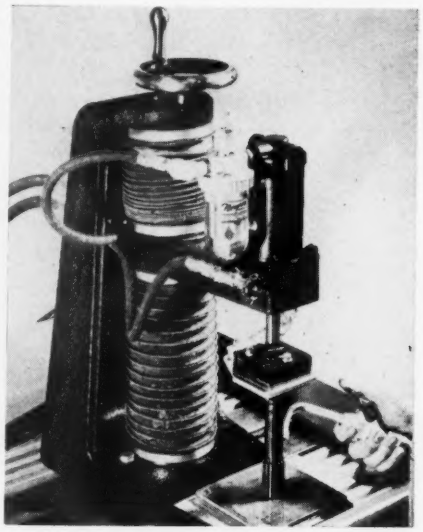
ing metal pouring is locked to the crucible body by a special dovetail joint, said to be foolproof even if cement loosens. Each spout is custom fitted to the crucible to which it is to be supplied. The pouring lips are about 9 in. long and weigh over 6 lb each.

For More Details Circle No. 13—Page 221

**Magnetizing Jig:** Magnaflux Corp., 7300 West Lawrence Ave., Chicago 31, Ill.—Special jig is an auxiliary fixture to the company's horizontal inspection unit and is claimed to reduce inspection man-hours on



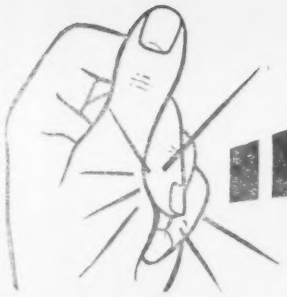
smaller parts without limiting in any way the versatility of the basic unit. Unit is attached with a lockshoe and draws power and air directly from the base unit. Adjustable contact heads will handle parts 12 in. long and up to 10 in. in diam.

For More Details Circle No. 14—Page 221

**Spectacle Pads:** Chicago Eye Shield Co., 2300 West Warren Blvd., Chicago 12, Ill.—New bridge-pads for company's line of spectacle-type goggles are made of polyethylene, flexible enough to adapt themselves to the contour of the wearer's nose. They are designed to spread the weight evenly and are said to remove any consciousness that eye protection is being worn.

For More Details Circle No. 15—Page 221

**Hydraulic Pumps:** Dudco Division, New York Air Brake Co., 1700 East Nine Mile Rd., Hazel Park, Mich.—Two series of high pressure, variable delivery pumps are for use in hydraulic systems requiring constant high pressures with control of fluid delivery from zero to full flow. Two types of control can be supplied —a handwheel control for manual adjustment of output and a pressure compensated control for automatic regulation of pressure and flow. The



# IDEAS FOR FOUNDRYMEN

**HERE ARE QUICK REVIEWS OF NEW LITERATURE—available to foundrymen as "idea" and reference information. Readers in the United States and Canada may obtain copies by using the attached cards. Readers in foreign countries should write direct to the manufacturer offering literature.**

## 81. Power Transmission

Link-Belt Co., Dept. PR, 307 North Michigan Ave., Chicago 1, Ill.—Standard lines of power transmission and conveying equipment are depicted in catalog 950. This 340-page indexed guide includes data on a complete line of chains for conveying and power transmission, ball and roller bearings, enclosed gear drives, clutches, gears and couplings. One section lists components for screw conveyors, belt conveyors, overhead trolley conveyors and oscillating conveyors. Tables of preselected assemblies, capacity charts and dimension tables for all standard products are included.

## 82. Industrial Trucks

Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3, O. — Power industrial trucks are the subject of a new eight-page catalog. Sections are devoted to fork trucks, platform trucks and crane trucks. Each truck type is detailed in a separate section with photographs of individual models, operating and design information, and complete specifications. Another section of the catalog contains pictures and data on more than a dozen attachments designed to increase flexibility of the industrial trucks.

## 83. Aluminum Castings

George Sall Metals Co., 2300 East Butler St., Philadelphia 37, Pa.—New booklet gives information on the production of leakproof aluminum castings. Included are suggested operational methods by which foundrymen can produce castings of intricate design and high quality to meet rigid specifications.

## 84. Thermocouples

Bristol Co., Waterbury 20, Conn.—Thermocouples and pyrometer accessories are depicted in a 56-page bulletin, P1238. Engineering data on the selection and installation of the proper types of thermocouples, wells, head assemblies and other pyrometer accessories are given, as well as recommended thermocouples for specific installations. Thermocouple calibration tables and 165 photos and line drawings are included.

## 85. Furnace Maintenance

Crucible Manufacturers' Association, 27 William St., New York 5, N. Y.—Bulletin 3 of a series on crucible melting tells how proper care and maintenance of crucible furnaces pays dividends. Information is given on furnace linings, base blocks and furnace bottoms, furnace covers, and burner and slag blocks. Condition of the furnace, metal quality and the effect of fluxing materials on linings also are considered.

## 86. Carbide Tool Selection

Carboloy, Department of General Electric Co., Detroit 32, Mich.—Tables designed to make carbide tool selection easier suggest first choice carbide grades and secondary selections for various materials machined in metalworking plants. The tables include speeds, feeds and depths of cuts for work on steels, cast iron, nonferrous and nonmetallic materials.

## 87. Pattern Lumber

Kindt-Collins Co., 12651 Elmwood Ave., Cleveland 11, O.—Corisa, a pattern lumber said to be lighter than pine but just as strong, is described in a bulletin which pictures patterns made from the wood. Corisa is graded in accordance with the National Hardwood Association Rules and is kiln-dried to a moisture content of approximately 9 per cent.

## 88. Nickel Cast Iron

International Nickel Co., 67 Wall St., New York 5, N. Y.—Applications of corrosion resistant nickel alloyed cast iron are featured in bulletin A-71. Mechanical and physical properties are tabulated and problem data

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sheets are included for submitting heat corrosion or controlled expansion problems to the development and research staff.

### 89. Air and Gas Compressors

Pennsylvania Pump & Compressor Co., Easton, Pa.—Horizontal single-stage heavy duty compressors are depicted in bulletin 201-C. Operating principles are made clear by sectioned drawings; individual photos show the construction of important parts. A table gives available sizes, capacities and ratings.

### 90. Refractory Gunning

Basic Refractories Inc., 845 Hanna Bldg., Cleveland 15, O.—History, development and current gunning practices are discussed in a new full color, illustrated 12-page booklet. In addition to outlining the advantages of refractory air-emplacement, the booklet briefly traces the evolution of basic gun refractories.

### 91. Gas Products

Air Reduction Co., Lincoln Bldg., 60 East 42nd St., New York 17, N. Y. —Products and services of various divisions of the company are described in an illustrated 34-page book. Gases used in the welding process are given an extended treatment. Processes used in the manufacture of gases are explained.

### 92. Silicone Grease

Dow Corning Corp., Midland, Mich. —New brochure describes a silicone fluid-carbon black mixture designed for lubrication of high temperature, slow speed bearings. Applications discussed include oven conveyor bearings, dolly wheels and permanent casting machines.

### 93. Sprue Mills

C. O. Bartlett & Snow Co., 6200 Harvard Ave., Cleveland 5, O.—Bulletin 112 depicts specially designed mills that clean sand from foundry sprue so that only cleaned sprue is charged into the cupola. The bulletin gives dimensions of three standard mill sizes and illustrates typical loading and discharging arrangements.

### 94. Grinding Wheel Safety

Grinding Wheel Institute, 2130 Keith Bldg., Cleveland 15, O.— Twenty simple safety precautions which each grinding wheel user should check when operating a grinding machine are listed in a pamphlet. Also listed are 12 available publications devoted to safety.

### 95. Fast Mold Wash Drying

Frederic B. Stevens Inc., 1800 Eighteenth St., Detroit 16, Mich.— Bulletin 109 describes the use of solvent liquids as carriers for mold and core washes for speeding the drying of washes. Three types of washes are available, one for flame igniting to speed drying, one for torch drying and one for air drying.

### 96. Grinding Wheels

Nu-Matic Grinders Inc., 8224 Carnegie Ave., Cleveland 3, O.—Abrasive band grinding, using air-inflated rubber grinding wheels is described in an illustrated folder. Construction features of the unit are pictured and various models and accessories are shown. Uses are described and methods of mounting are depicted.

### 97. Blowers

Hartzell Propeller Fan Co., Piqua, O.—Complete dimensions, specifications and performance data on non-overloading utility blowers with backward curved blades are presented in a new bulletin, BC-11. Both direct-drive and belt-drive blowers are covered in this 48-page catalog.

### 98. Plastic Refractory

North American Refractories Co., Cleveland 14, O.—New slag-resistant plastic refractory for use in ladles and cupolas is described in bulletin 106. Information on installation, packaging and storage is given.

### 99. Scrap Metals

Michigan Foundry Supply Co., 700 West Western, Muskegon, Mich.— Bulletin describes facilities for processing scrap metal for reuse. Sorting, shearing, baling, crushing and briquetting operations are illustrated.

### 100. Cutting Torch

Arcair Co., 423 South Mt. Pleasant Ave., Lancaster, O.—Case history booklet shows detailed on-the-job reports on the use of a cutting and gouging torch that uses only an electric arc and compressed air.

### 101. Tumbling Abrasive

Simonds Abrasive Co., Tacony and Fraley St., Philadelphia 37, Pa.—Aluminum oxide tumbling abrasive for precision barrel finishing of a wide variety of parts and materials is described in bulletin ESA-236.

### 102. Shell Molding

Durez Plastics & Chemicals Inc., 1002 Walck Rd., North Tonawanda, N. Y.—News from the shell molding field is presented in an illustrated bulletin. New machines and shell mold castings are pictured.

### 103. Diecasting Machines

Lake Erie Engineering Corp., Box 68, Kenmore Station, Buffalo 17, N. Y.—Condensed general bulletin 1.1 includes photos and charts covering hydraulic presses and diecasting machines.




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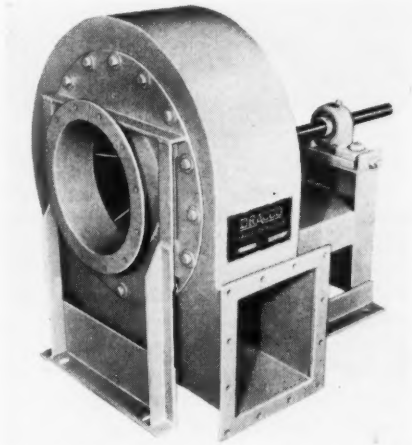
manufacturer recommends the manually controlled models as the source of high pressure on high-low pressure systems for hydraulic presses, die casting and plastic molding machines, closing and holding devices and machine tools. Pumps generate continuous duty pressure up to 5000 psi and deliver 3.0 gpm at 1200 rpm. At maximum continuous speed of 2000 rpm, and full rated pressure, they deliver 4.0 gpm and provide over 11 hydraulic horsepower.

For More Details Circle No. 16—Page 221

**Industrial Fans:** Dracco Corp., Harvard Ave. at East 116th St., Cleveland 5, O.—Heavy-gage, welded steel construction industrial fans have uses in a variety of air han-



dling industrial applications involving gases or air-entrained materials. Clean or dirty air, fumes, dust, refuse, shavings or stringy material can be handled. Specialized fans can convey explosives, gases up to 800° F or corrosive materials. Sizes with inlet diameters from 11 to 38 in., pressures up to 17 in. sp and capacities from 500 to 46,000 cfm can be supplied.

For More Details Circle No. 17—Page 221

**Exposure Calculator:** British Steel Castings Research Association, Broomgrove Lodge, Sheffield 10, Eng. has scales for use with isotopes caesium 137, thulium 170, cobalt 60, iridium 192 and radon. Thulium 170 is a useful source for examination of sections of steel less than ½-in. thick, or in other cases where low to medium energy radiation is required.

For More Details Circle No. 18—Page 221

**Pickling Aids:** E. F. Houghton & Co., 303 West Lehigh Ave., Philadelphia 33, Pa.—New foam-producing pickling inhibitor produces clean surfaces and is said to be especially useful where bright work is desired. Pickling speed is increased and drag-out losses are minimized by high wetting out and detergent ability. Also


New, improved Taylor Made

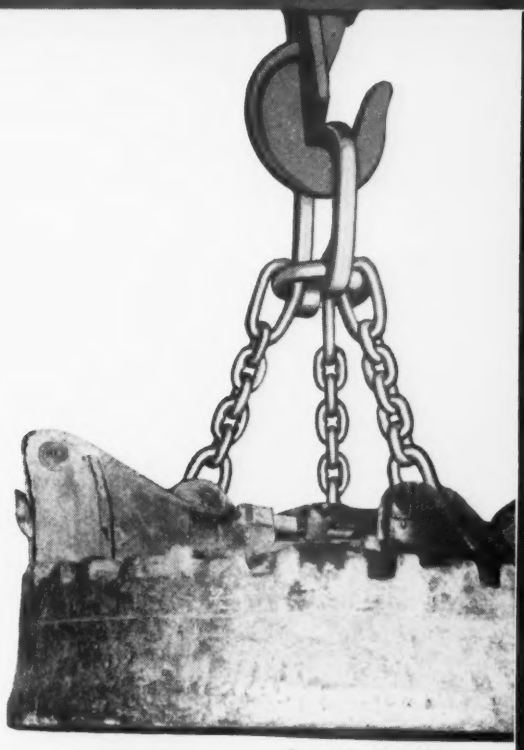
ALLOY STEEL

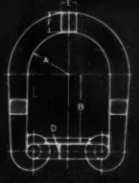
DOWNTOWN TYPE

MAGNET CHAIN

lasts 5 to 15 times longer

than conventional three-leg types!





New Lifting Bail Design

provides larger opening for crane hook. Heavy, squared-type Alloy Steel construction assures longer life.

Locating Plate

takes larger joiner links with squared top sections—keeps chain legs at 120° centers to reduce wear due to friction, twisting and gouging.

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available is a cationic foam-producing chemical which can be used in any desired concentration to provide various foaming action. Fast acid penetration is assured by its wetting action. A third, nonfoaming inhibitor offers high stability and maintains its effectiveness over long periods of use or storage.

For More Details Circle No. 19—Page 221

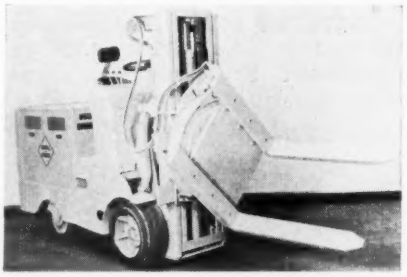
**Shaft Coupling:** Falk Corp., 3001 West Canal St., Milwaukee 8, Wis.—Spacer-type flexible shaft coupling is said to be ideal for use between motors and pumps (where a gap between shafts must be provided to permit removal of pump impeller shaft assemblies) or on applications where a large gap (up to 12 in.) cannot be avoided.

For More Details Circle No. 20—Page 221

**Sound Protectors:** American Optical Co., Safety Products Division, Southbridge, Mass.—New sound protectors are said to prevent harmfull effect of noise by screening out loud, high-frequency noises, although voices remain audible to the wearer. Soft vinyl foam pads, worn externally, are used to muffle the ears and the adjacent bony structure which also transmits sound.

For More Details Circle No. 21—Page 221

**Fork Truck Unit:** Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3, O.—Rotating unit is for use on company's 8000 lb capacity fork truck for a variety of dumping operations. It provides 360-degree continuous rotation and can handle up to 10,000-lb loads depending upon



the basic truck capacity. Unit is powered by a gear type hydraulic motor driving through a worm and gear reduction unit. Fork spread and fork length can be altered to suit individual operating requirements. Additional attachments can be installed in front of the rotating unit in place of forks when both the rotating feature and other load carrying attachments are required.

For More Details Circle No. 22—Page 221

**Shelving:** Standard Pressed Steel Co., Jenkintown, Pa.—Line of steel shelving with a reported 1000 combinations permits the custom assembling of an installation for virtually all storage needs. Components include posts, side and back panels, shelves, full and partial dividers, bin fronts, braces, label holders, swinging and sliding doors. Shelves in 35 different sizes from 9 x 36 in. to 36 x 48 in. can be supplied. Posts are available in heights from 39 to 123 in. by 12-in. increments.

For More Details Circle No. 23—Page 221

**Conveyor Line Gate:** Sage Equipment Co., 30 Essex St., Buffalo 13, N. Y.—Spring counterbalanced gate for use with gravity roller and wheel conveyors can be used across aisles so that intraplant traffic of personnel and trucks can be facilitated. Gate can be operated by one hand. Air and electrically operated gates for remote control operation also are available.

For More Details Circle No. 24—Page 221

**Metallurgical Microscope:** Bausch & Lomb Optical Co., 626 St. Paul St., Rochester 2, N. Y.—Microscope, with inclined binocular body, can be used in examination of opaque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Desmond's New BELTBRASIVE Dresser

Up to 40% longer life and substantially greater stock removal from coated abrasive belts are proven results with the Desmond Beltbrasive dresser. You not only get better performance on discs, belts, or drum sanders and polishers, but you save time on changing them. This is another Desmond "first." Ask your Desmond distributor for full information or write for Bulletin D-12.

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Ladle #3 - 12,000 lb. capacity
Lined Aug. 20, 1952
Relined Nov. 5, 1954
Refractory Cost $30.00
Type of metal - gray iron
A. W. Varnon
Foundry Superintendent

Mr. Varnon states that no maintenance or patching was ever done on the sides or bottom of the ladle. The *Ironton* NOJOINT was used exactly as received. Ladles with capacities of 14,000#, 18,000# and 30,000# — as well as numerous smaller ladles . . . lined with *Ironton* NOJOINT . . . have been in service for 12 months or more. None of these linings show signs of needing replacement yet. Competitive materials averaged *only one month's* service. Test and prove to yourself the value of *Ironton* NOJOINT in your own foundry.

**IRONTON SERVICE ENGINEERS** will be glad to supervise the installation of *Ironton* NOJOINT in your foundry. WRITE OR PHONE TODAY

**Want the Ironton office direct? Phone Ironton 109, or 110**

**RELIABLE REFRACTORIES**

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IRONTON, OHIO

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| BOSTON, Mass. HAncock 6-1210 | CLEVELAND, O. VUlcan 3-8200 | LYNCHBURG, Va. Phone 2-8374 | ST. PAUL, Minn. EMerson 6312 |
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# STANDARD HAS ENGINEERED AND BUILT FOUNDRY CONVEYORS SINCE 1906

Standard Conveyor Company has an experience record of almost a half century — engineering and building foundry conveyors. On any foundry handling problem Standard can aid you to select and install conveyors that will give you reduced handling time — uninterrupted smooth flow in production — careful safe handling of light or heavy molds — better storage facilities — and help conserve and better utilize existing foundry space.

Available in a wide range of sizes, weights and types — equipped with shielded bearings expressly designed for severe foundry service — to suit a wide variety of foundry applications. Whatever your specific need, Standard is qualified by experience and facilities to recommend and furnish the right type of conveyors.

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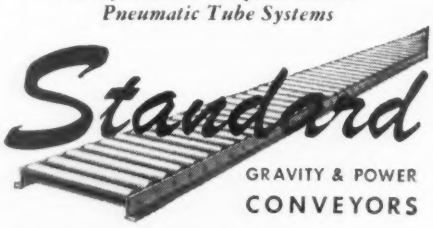
*Engineered Conveyor Systems — Portable Conveyor Units — Spiral Chutes — Pneumatic Tube Systems*

Send for Standard's special catalog "Conveyors for Foundries" — a valuable reference book illustrating and describing conveyor installations in leading foundries.

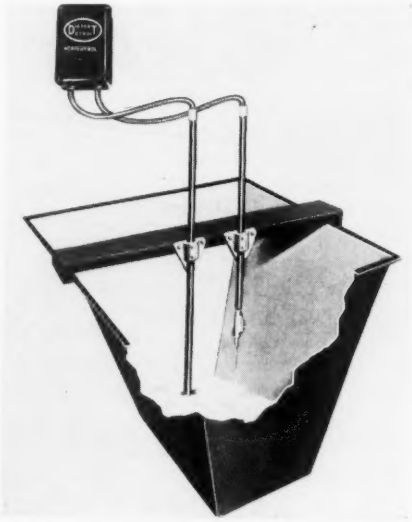



ENGINEERED FOR LOW-COST PRODUCTION


objects, polished metal specimens and similar materials under bright field or dark field illumination, or with polarized light. Magnifications of 650X are possible with bright field, dark field or polarized light. Other objectives are available for higher magnifications with bright field only. Change from bright to dark field illumination is made by swinging a control stop into the light beam. Polarized light is produced by inserting a polarizer in the filter slot and slipping an analyzer cap over the eyepiece.

For More Details Circle No. 25—Page 221

**Sand Flow Control:** Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4, Mich.—Unit for automatic control of sand flow to molders' hoppers consists of an electronic relay in a dust-tight case, two probe mounting brackets, two probes and two 20-ft lengths of electric cable. A few microamperes flow in the probe circuit will cause unit to operate. Open or closed contacts can be used to start or stop a belt conveyor, pneumatic conveyor, muller, control a sand plow, or operate alarms or lights. Unit is designed for both high and low level control of tempered sand in storage bins, slinger hoppers or molders' hoppers. Another model with only one probe is for either high or low level control.



For More Details Circle No. 26—Page 221

**Recorder Charts:** Foxboro Co., 322 Neponset Ave., Foxboro, Mass. —New type circular and strip chart paper has special properties said to improve the legibility of instrument records. The charts are printed under controlled humidity conditions on a white sulphite sheet, meeting rigid standards of uniformity and stability. Special sizing agents are added to permit sharp, distinct recording without "feathering." Scale markings and

***Baird Associates Presents...***

# Quality Control On The Production Floor

With the new Baird Spectromet*, spectrochemical analysis is possible directly on the floor of the foundry and in the meltshop. Thirty to forty seconds after the sample is burned, the concentrations of six elements in the sample are read from indicators located on the face of Spectromet*. The indicator readings can be easily and rapidly translated into accurate corrections in the melt and give constant control of the contents of the melt.

The speed of the instrument's operation permits as many as 180 determinations per hour providing practical analytical data at low cost per sample.

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For more information why Spectromet* can help serve your analytical needs, write for free technical Bulletin #42.

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**33 University Road · Cambridge 38, Mass.**

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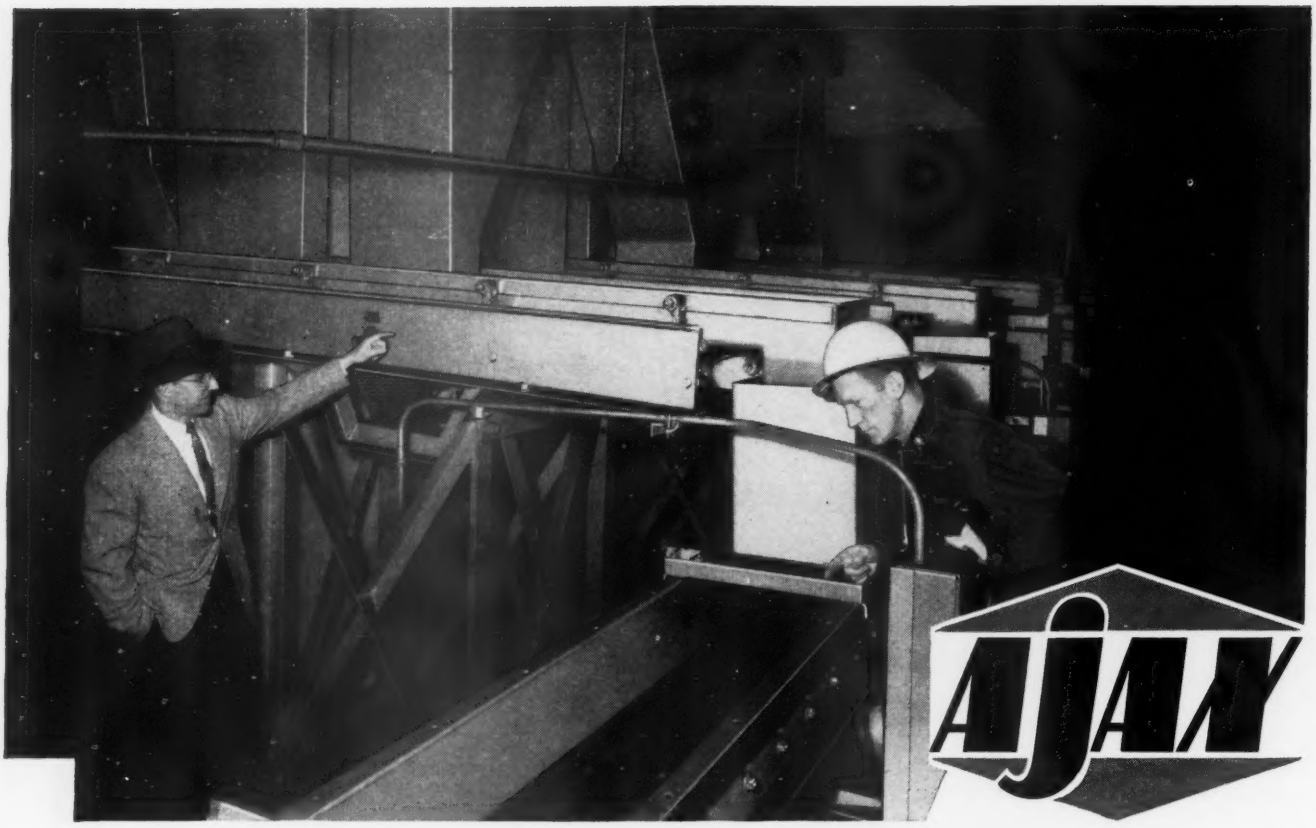



# AJAX LO-VEYORS

## BUILT INTO MODERN FOUNDRY SYSTEM

Photograph shows typical arrangement of Ajax Lo-Veyors with motor driven reciprocating drive mounted below.

Elimination of exposed bearings reduces maintenance cost of Ajax Lo-Veyors particularly under foundry conditions where abrasive sand is encountered.

Ajax Lo-Veyors are available in a wide range of lengths and capacities to fit every condition.

Rivers of foundry sand flow from shakeouts to tumblers to dryers on Ajax Lo-Veyors. Tonnage is measured in thousands. Around-the-clock operation is building new production records.

The photograph shows just a small part of this new ultra-modern automotive foundry equipped with Ajax Lo-Veyors.

They are cutting costs in conveying, separating and screening foundry sand. Whether you are an original equipment manufacturer, a captive or custom foundry, . . . look into the performance, reliability and economy of Ajax Lo-Veyors.

*Write for Bulletin 39 right now.*

**AJAX FLEXIBLE COUPLING CO. INC.**

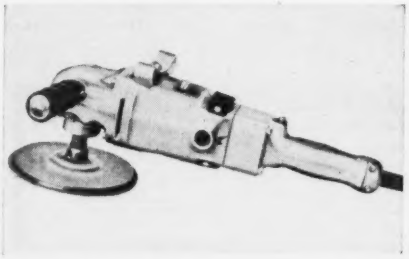
**Westfield, N. Y.**

REPRESENTATIVES IN PRINCIPAL CITIES

dime arcs are printed in a neutral gray for vivid contrast with colored recording inks. Eccentricity tolerance of less than 0.002-in. between the hub hole and scale circles is held on circular charts by printing and punching the center hole in one operation.

For More Details Circle No. 27—Page 221

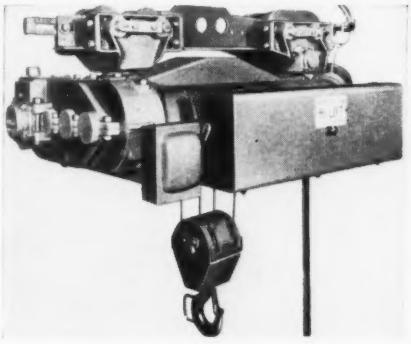
**Sander:** Black & Decker Mfg. Co., Towson 4, Md.—Seven-inch sander features heat-treated spiral gears



to provide constant transmission of power at 4250 rpm from the motor to the spindle. A reversible side handle, three sanding discs of varying grits, rubber back-up pad, clamp washer, strap metal stand and spanner wrench are standard equipment. Unit weighs 10¾ lb and has an overall length of 17¾ in. Tool is available for either 115 or 220-v ac or dc operation.

For More Details Circle No. 28—Page 221

**Electric Hoist:** Northern Engineering Works, 210 Chene St., Detroit 7, Mich.—Electric hoist is built



in capacities from 3 to 15 tons, and is equipped with double four-wheel swiveled trucks to distribute the load on the supporting track and to reduce wear on truck wheels and track. Hoist and trolley travel are controlled either by a pendant pushbutton or from an operator's cab. Heavy-duty ac or dc motors and full magnetic control are furnished. Hoist has an all-steel frame, roller bearings, hardened steel gears, large drum and sheaves.

For More Details Circle No. 29—Page 221

**Soap Dispenser:** Gus J. Schaffner Co., Schaffner Bldg., Emsworth, Pittsburgh 2, Pa.—Dispenser has been developed to release paste soap that can be used either with or without water. One push of the handle dispenses enough heavy-duty, hand cleaner for one washing. A throwaway type cartridge containing enough hand cleaner for 300 washings is used. It can be replaced in 60 seconds.

For More Details Circle No. 30—Page 221

**Rectifier Welder:** Hobart Bros. Co., Troy, O.—A 300-amp dc selenium rectifier type arc welder features a five-range control switch that provides coarse adjustment with generous overlap between ranges to provide dual control. Rheostat, which can be removed for remote control, provides continuous control by adjusting the direct current through the control coils. These controls provide a welding current range of 35 to 425 amp for use with a variety of electrode sizes.

For More Details Circle No. 31—Page 221

**X-Ray Generator:** High Voltage Engineering Corp., Cambridge, Mass.—One-million volt x-ray generator


Meet today's need for...

HIGHER EFFICIENCY

Use PORITE Ceramic Strainer Cores

If you now use sand strainer cores—here is a real opportunity for higher efficiency in your pouring operations! Porcelain Products' *ceramic* strainer cores are a proven factor in providing cleaner, slag-free castings—reducing foundry rejects—contributing to more efficient foundry operation.

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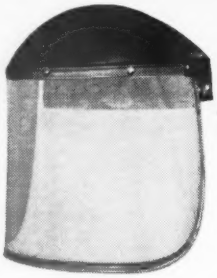
## Wire Screen FACE SHIELDS

No. 759



No. 758

Both Shield No. 759 and 758 provide adequate protection against hot sparks and chips. They are useful for metal pouring and other hot jobs and are bright-finished for heat deflection. Increased comfort and heat insulation are provided by adjustable formed fiber headgear which is fitted with leather sweatband.

Shield No. 758 is provided with a deflector crown which gives added protection to the forehead.

## No. 96 Dust Respirator

• This approved dust respirator combines high filtration ability with low resistance to breathing. Outstanding qualities of the wool-felt filter material permit a smaller filter area without affecting performance. Pliable rubber facepiece provides a comfortable, leakproof fit. Dual headbands support the facepiece with minimum tension and produce a perfect seal along all facial contacts. This filter is readily converted to an approved, organic vapor, cartridge-type respirator.

## Chippers Cup Goggle No. 545-C

• Workers proclaim this to be the most comfortable goggle ever developed. Left and right cups are contour engineered. COMFORT-KING headbands eliminate all pressure. The goggle fits naturally and snugly into protective position. Simplified bridge adjustment assures correct fit on all faces.

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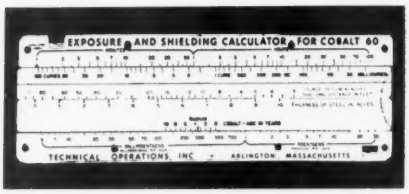
can be mounted on a motorized carriage to move the source to any part of a plant. Unit operates by plugging in a power cable and can be used at any angle from horizontal to vertical. Generator is 6 ft long, 36 in. in diam and weighs 2500 lb. Radiographs through metal sections up to 5 in. thick are possible, according to the manufacturer.

For More Details Circle No. 32—Page 221

**Exposure Calculator:** Technical Operations Inc., 6 Schouler Court, Arlington, Mass.—Slide rule type radiographic exposure calculator inte-




grates the many variables characteristic of any radiographic problem into a single calculation. Provision is made for evaluating the type of film used, photographic density required, thickness of specimen, source-to-film distance, and strength distance. A calibration is provided to determine exposures for radium sources.

For More Details Circle No. 33—Page 221

**Bucket Scoop:** Lewis - Shepard Products Inc., Watertown, Mass.—Hydraulic dump bucket scoop attach-

ment of 5 or 10 cu ft capacity is detachable and interchangeable with standard forks on the company's fork lift trucks. Double-acting hydraulic cylinder allows controlled dumping. Scoop tilts up 10 degrees to hold material in transit. To dump completely, it tilts down 40 degrees. All controls are located in operator's compartment.

For More Details Circle No. 34—Page 221

**Dry Fluid Drive:** Dodge Mfg. Corp., Mishawaka, Ind.—New development in industrial power transmission, described as a dry fluid drive, is said to handle difficult starting and

# BENTONITE as you like it!

*Black Hills 80*. Granular; produced to the lowest possible dust level to eliminate loss at the muller. For maximum efficiency with systems which include fines-removal equipment.

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*BLACK HILLS BENTONITE* pulverized or 200-mesh. Selected by foundries generally for rapid mulling. Strong, uniform, dependable.

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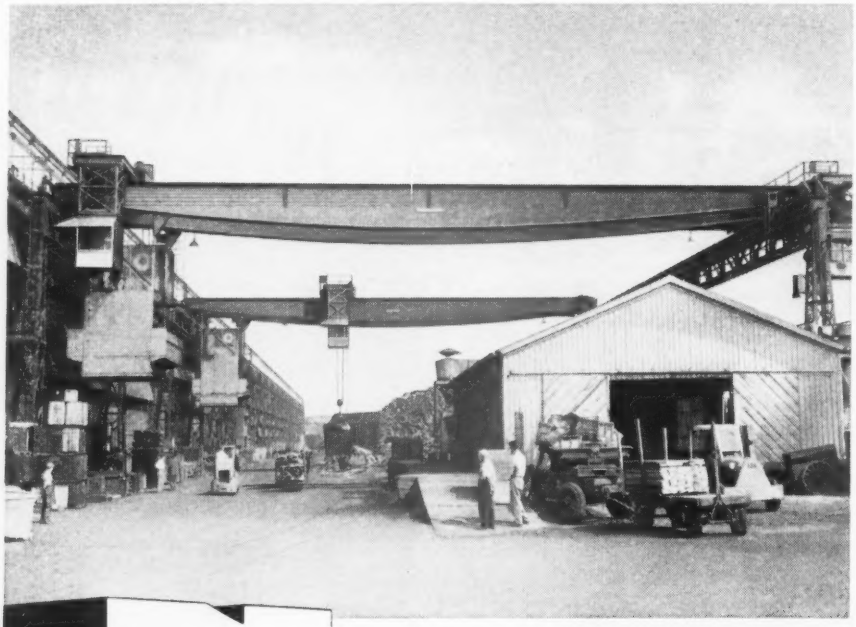
# Look overhead..see "NORTHERN"



**NORTHERN CRANES uniquely adapted *for the Foundry Yard!***

These two 10-ton, 100-foot span NORTHERN OVERHEAD ELECTRIC TRAVELING CRANES are installed in the foundry yard of a large automotive manufacturing company. To provide better vision and control of loading and unloading in all crane operations, the operators' cabs are attached to and travel with the crane trolleys.

Transfer loading to other handling equipment by means of batch weighing and loading hoppers was designed, built and installed by the customer company.

Here is another example in the short-cutting of repetitive, unprofitable materials handling. It demonstrates the substantial benefits of imaginative thinking in solving cost problems in all areas of foundry operation.

*Let us send you Bulletins G-700 and SE-108.*

**NORTHERN** CRANES - HOISTS - TRAVELATORS

**NORTHERN ENGINEERING WORKS**
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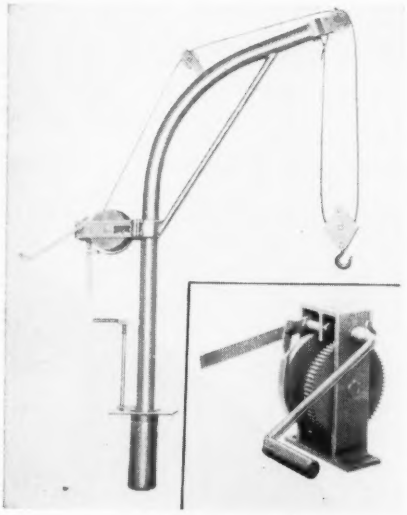
reversing problems easily and to give protection against shock and overloads. The drive is made up of a housing inside of which a rotor is free to turn concentrically. Between the two are fine particles of spherical steel shot, called the flow charge, which acts much like a fluid. The flow charge transmits power from the housing to the rotor. At normal operating speeds there is no slippage, yet in case of an overload, slippage gives protection.

For More Details Circle No. 35—Page 221

**Truck Cranes:** H. S. Watson Co., 1316 67th St., Emeryville, Calif.—Truck-mounted cranes and hand-operated winches are designed to save labor and shorten loading and unloading time. Crane is available in 500, 1000 and 2000 lb capacities and features a full-circle swing to simplify one-man operation. All cranes and hand winches incorporate steel cut gears and drop forged steel ratchet, spring loaded for safety. Two winch styles are available, each of 1000 lb capacity.



For More Details Circle No. 36—Page 221

**Low-Hydrogen Electrode:** P & H Welding Equipment Division, Harnischfeger Corp., 4618 West National Ave., Milwaukee 46, Wis.—New type of low-hydrogen electrode for high-speed welding is said to have improved stability and ease of handling. Faster speed in application and improved striking and restriking characteristics are claimed for the electrodes, which are available in sizes from $\frac{3}{32}$ to $\frac{1}{4}$-in.

For More Details Circle No. 37—Page 221

**Roof Ventilator:** Hartzell Propeller Fan Co., Piqua, O.—Roof ventilator fan features a galvanized steel windband mounted over a curb base of heavy galvanized steel. Fan mount is bolted directly to the base, with

# FOUNDREZ 7600 . . .

## for flexibility in meeting special core production problems

● Using FOUNDREZ 7600 as their sand binder, many of our customers are making the core mix that's just right for their particular casting metal, oven capacity and production rate.

This liquid water-soluble thermosetting urea-formaldehyde resin permits the widest variation of core properties. It enables you to adjust green strength, collapsibility, permeability, hardness. Thus, you can produce the core that's best for the metal you're casting . . . copper, brass, bronze, aluminum, magnesium, gray iron, cast iron, steel alloys.

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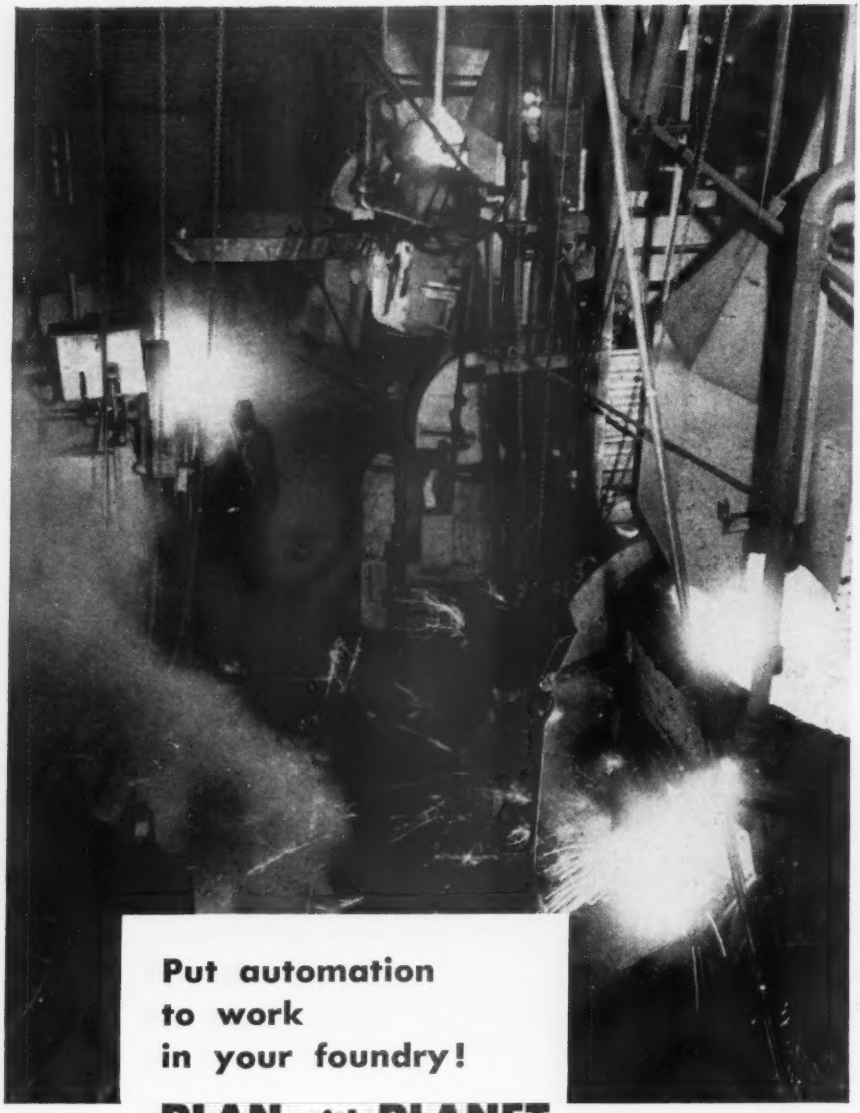

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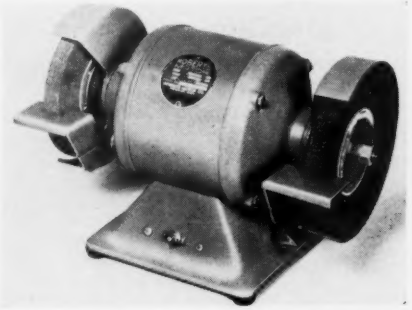
the inner diameter in the base formed into a fan ring. Lids turn on plastic bearings and close weathertight when fan is off. Capacities from 3000 to 26,400 cfm are available in 18, 24, 32, 36, and 42-in. models.

For More Details Circle No. 38—Page 221

**Bench Grinder:** Roberts Motor Co., 404 Union St., Bronson, Mich.—Bench grinder, mounted on rubber feet, features a fully enclosed 1/3-hp capacitator-type motor with sealed-in ball bearings, and is rated at 3450 rpm. Standard model is equipped



with one fine and one coarse wheel. Tool rests are adjustable to compensate for wheel wear. Wheel guards are removable to attach buffing or polishing wheels. Grinder is available in 110-v, single-phase, 60-cycle, or in 220-v, 3-phase, 60-cycle units. A 440-v, 3-phase, 60-cycle grinder also can be supplied.

For More Details Circle No. 39—Page 221

**Face Shield:** Fibre-Metal Products Co., Chester, Pa.—Lightweight head shield which protects against low impact exposures is form-fitting and offset-hinged at the friction points. Sweat bands are replaceable, genuine leather. Window support has snap fasteners to allow for replacement of worn windows and has ample clearance to permit wearing of prescription glasses. Protective windows for spark deflection, heat protection, acetylene welding or scarfing are available.

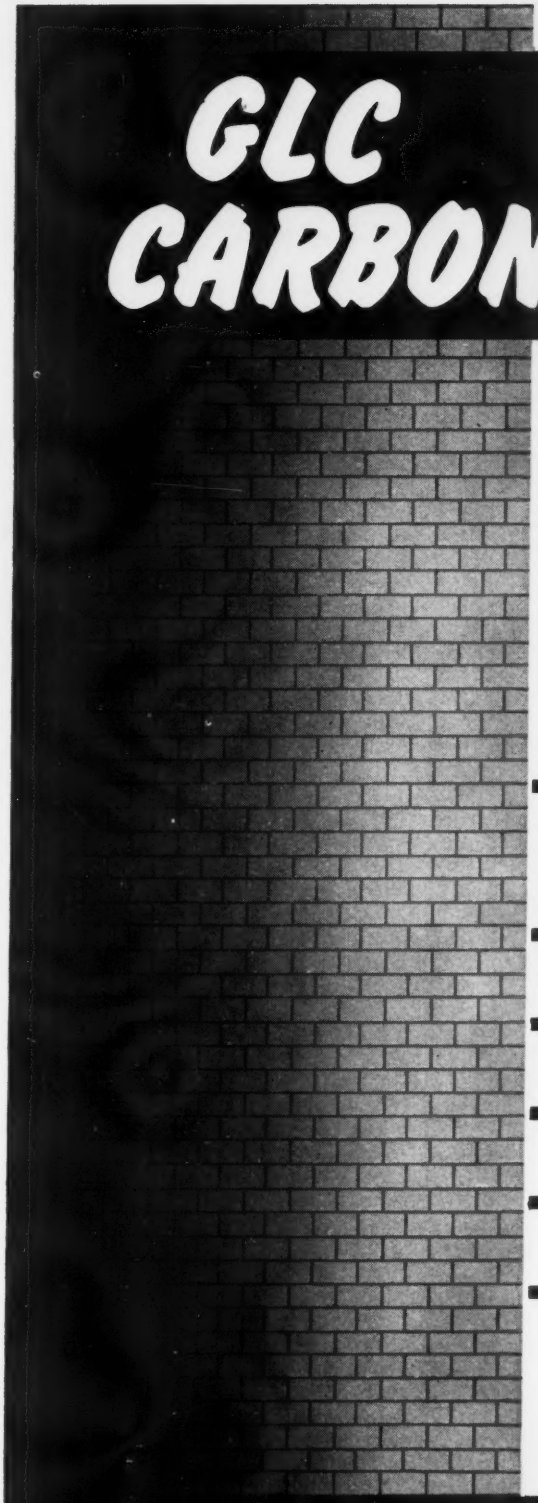
For More Details Circle No. 40—Page 221

**Wire Rope:** John A. Roebling's Sons Corp., 640 South Broad St., Trenton 2, N. J.—New wire rope, made with steel cores, is said to have 15 per cent greater strength and higher resistance to wear from bending and abrasion than types previously made. The new rope is to be manufactured primarily in preformed constructions. Available rope sizes range from ¼ to 3½ in.

For More Details Circle No. 41—Page 221

**Fork Lift:** Kwik-Mix Co., 3029 West Concordia, Milwaukee 16, Wisc.—Powered fork lift unit has been modified to increase its lifting range

# GLC CARBON BRICK



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- Dimensional stability
- Low thermal expansion
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- Resistance to slag build-up
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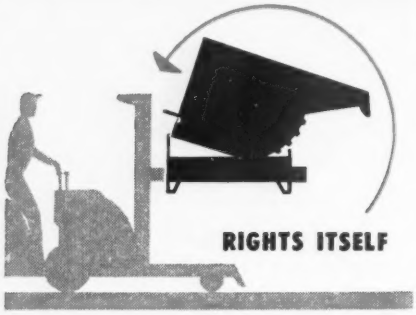
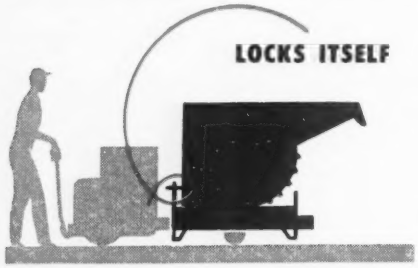
Overseas Carbon & Coke Company, Inc., Geneva, Switzerland; Great Eastern Carbon & Chemical Co., Inc., Chiyoda-Ku, Tokyo, Japan

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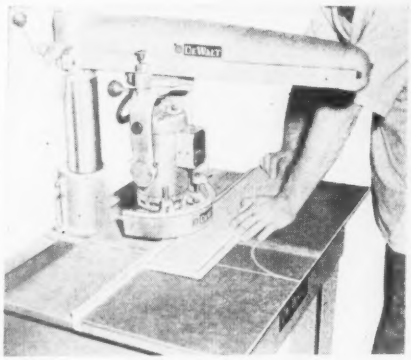
from 5 ft to a maximum 6 ft height without a decrease in load capacity. Another model is available to lift a 1500 lb load to a height of 7 ft in 14 seconds. Fork lift attachment can be interchanged with a 10 cu ft capacity hopper body, 1500 lb capacity flatbed platform or a 5 ft scraper blade.

For More Details Circle No. 42—Page 221

**Shaper Guard:** DeWalt Inc., Lancaster, Pa.—Metal guard for use with company's radial arm woodworking machines encloses knives and motor spindle when used for shaping appli-



cations. Guard surrounds the cutting head on all exposed sides as well as across the top, leaving only the space beneath it free for feeding of material into the knives. Motor and cutting mechanism are suspended above the working surface and because of this design the shaper head enters the stock from above, allowing the shaper guard device to cover all approaches to the knives during operation.

For More Details Circle No. 43—Page 221

**Air Compressor:** Allis-Chalmers Mfg. Co., General Machinery Division, Milwaukee 1, Wis.—New line of two-stage 100-lb rotary air compressor/vacuum pumps has been designed for shop air systems, pneumatic conveyors and similar applications. The compressor/vacuum pump is water cooled and consists of a separate low-pressure unit coupled to a high-pressure unit. It is designed for direct connection to motors, although it may be driven through speed decreasing or increasing gears by motors, engines or turbines. Units are available in eight sizes to handle approximately 250 to 1800 cfm and for pressures ranging from 60 to 125 lb.

For More Details Circle No. 44—Page 221

**Tumbling Abrasive:** Exolon Co., 996 East Niagara St., Tonawanda, N. Y.—New abrasive product for barrel finishing is made from aluminum oxide processed to remove sharp edges which might scratch the work. The abrasive is made in an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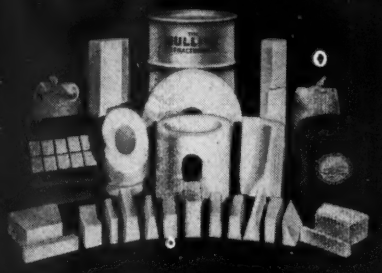

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electric arc furnace from bauxite which is melted and forms hard aluminum oxide crystals with facets in every direction. Constant use of the material does not impair the abrasive quality, but only reduces the size of the particles.

For More Details Circle No. 45—Page 221

**$CO_2$ Process:** Foundry Services Inc., 2000 Bruck St., Columbus 7, O.—New sodium silicate-base material designed for use with application of carbon dioxide gas is claimed to form an effective bonding agent in production of cores and molds. The material, which is in liquid form, is added to cold, dry sand and mixed for about the same length of time as other binders. Amount of material required depends on presence of clay and other fine materials in the sand as well as on fineness of the sand itself and varies from 2½ to 6 per cent.

Small amounts of additives such as wood flour, seacoal and pelleted pitch can be added to the sand mix to improve surface finish. Sand mix is handled similarly to green sand for production of cores and molds and may be rammed by hand or machine. After sand mix is in place in the core box or flask, it is subjected to injection of carbon dioxide at slightly over atmospheric pressure (15 to 20 psi) for 15 to 20 seconds.

Injection of carbon dioxide may be accomplished by several methods. These include pushing small tubes at 4 to 5-in. centers close to face of core or mold; placing a tight-fitting cover, through which the gas is admitted, over the corebox or mold and providing suitable vents on the bottom faces; or by arrangement of pattern or corebox to provide vents at the interface through which the carbon dioxide is admitted.

Subjecting the sand mix to carbon dioxide for the indicated time results in compression strengths of 200 to 300 psi with further increase when exposed to the atmosphere for 1 to 2 hr. After hardening, the core or mold is ready for use. With some types of castings it may be desirable to coat mold or core faces, and handling procedure will depend upon whether the coating employs a volatile compound or water as the vehicle. With the latter type the sand face may be torch or oven dried.

Cores and molds made with the silicate-base material are claimed to have excellent collapsibility. Known as $CO_2$Set, the material is said to be applicable in producing aluminum alloy, gray iron and steel castings.

For More Details Circle No. 46—Page 221

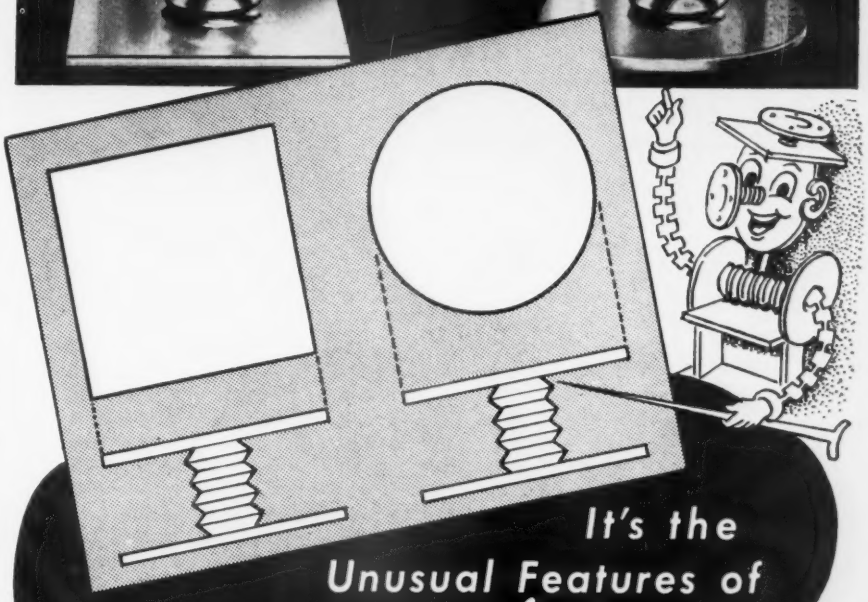

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Fig. 1—Excessive grinder speed is the cause of many wheel breakages. Avoid them by checking wheel speed regularly

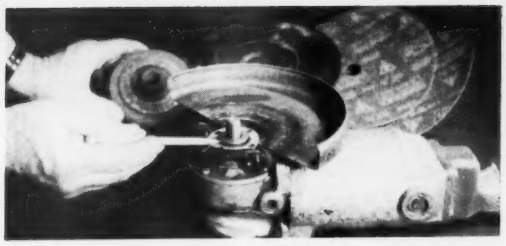

Fig. 2—Back flange on sander is 1¼ x ⅛-in., inadequate for 6-in. bonded abrasive cup wheels

Fig. 3—Improved threaded steel bushing is molded into back of cup wheels. Note angled prongs

# Preventing Wheel Breakage

## on Angle Portable Grinders

By GILBERT R. BLAKE
*Grinding Engineer*
Norton Co.
Worcester, Mass.

THE popular right angle or vertical type portable grinder, mounting 6-in. flaring cup wheels, is used extensively in foundry cleaning rooms. This tool's versatility and wide use perhaps is why it is subject to abusive treatment which can and often does result in dangerous and costly wheel breakages.

Some of the common causes of wheel breakage on these grinders and ways to eliminate or minimize them will be discussed here. With proper handling, periodic inspection and servicing of the grinder, as well as guarding of the wheel, most of these breakages can be prevented.

**Proper Guarding Difficult**—The nature of grinding jobs on which vertical type portable grinders are used admittedly has made effective guarding of the wheel difficult. Up to now, fabricated steel guards of conventional design, size and gage to provide adequate protection have been so heavy or otherwise offered some objectionable features that in most cases they were discarded.

In addition, with but few exceptions, molded-in threaded steel bushings commonly supplied in cup wheels for use on these grinders have been designed primarily to drive the wheel. No particular attention was paid to whether or not the bushing might also serve as an auxiliary protection device in the event of accidental wheel breakage by retaining the surrounding wheel pieces.

**Excessive Speeds Dangerous**—Where the portable grinders are of the air-driven or pneumatic type, as

Fig. 4—Illustration shows three 6-in. flaring cup wheels accidentally broken in service. In each case, prong-anchor bushing held all pieces

# 360 cores per hour with one man...

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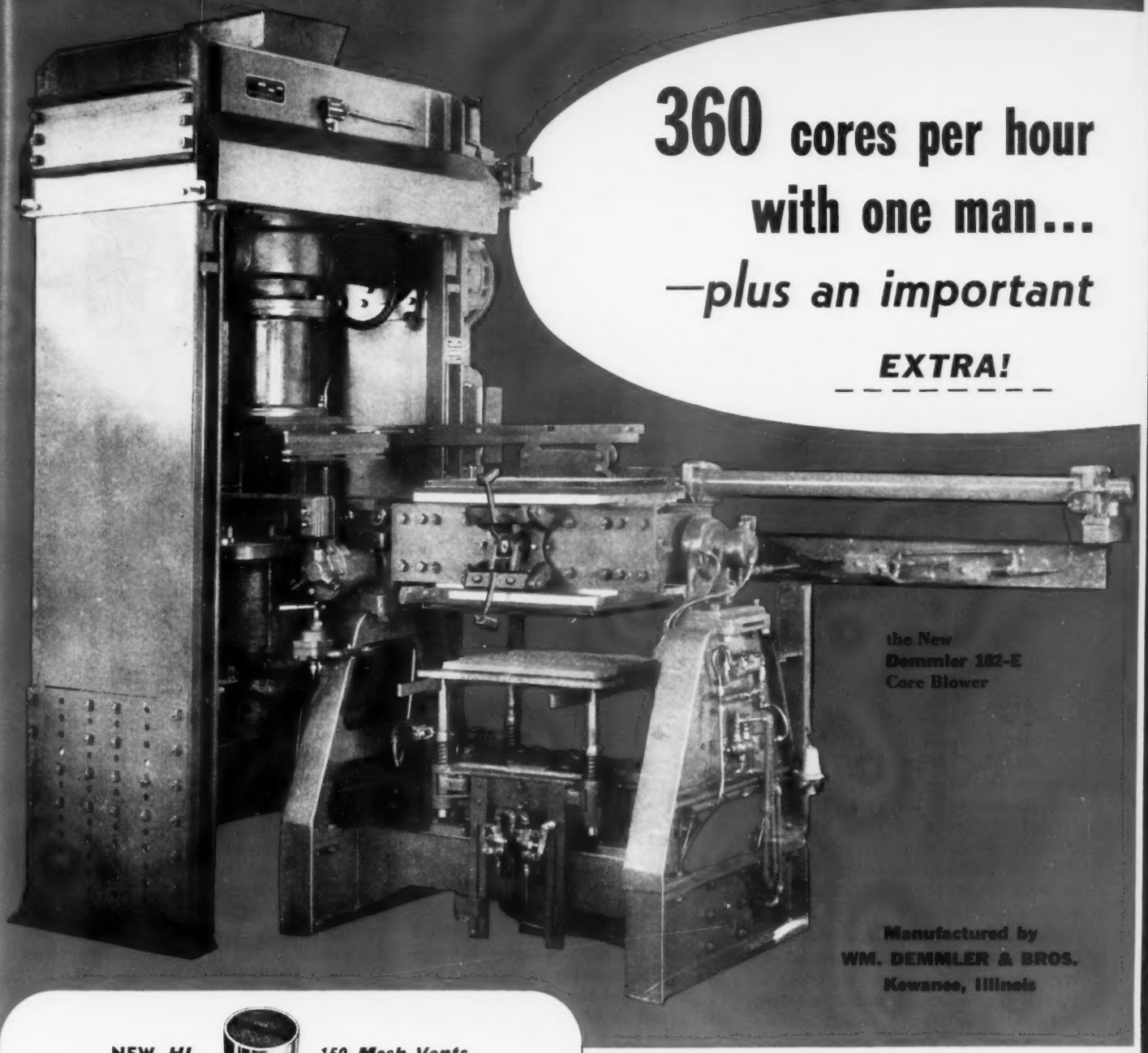

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That's why a Demmler Core Blower is a good investment. And, as operations change, your Demmler Core Blowers are flexible enough to be adapted for new jobs. This flexibility and rugged design accounts for the fact that many Demmler Core Blowers are still in service after 40 years of duty. It's easy to consult a Demmler engineer and you will be units ahead in production, dollars ahead in maintenance savings!

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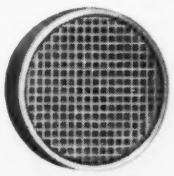
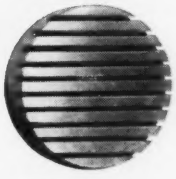


**TYPE L —** Lectromesh Vent

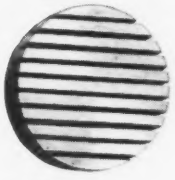
**TYPE B —** Perforated Vent

**TYPE A —** Perforated Vent

**TYPE H —** Screen Vent



**TYPE C —** Steel Slotted Vent



**TYPE D —** Brass Slotted Vent

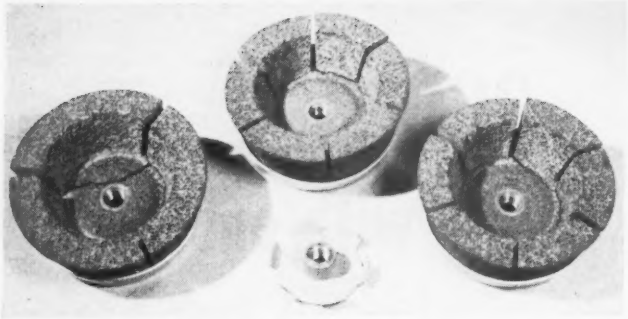


Fig. 5—Three test wheels with slotted rims looked like this after they had been broken purposely in a speed test machine with the revolving cup guards

Fig. 6—Same test wheels shown in Fig. 5 after removal of cup guards. Cup guard and bushing held the pieces together until machine could be stopped

perhaps a majority of those used for heavy-duty foundry and weld grinding are, overspeeding is also fairly common. This has caused many wheel breakages in the field. Tachometer readings taken on machines involved in breakages in customers' plants show that through wear or misadjustment of the governor mechanism, a machine rated at 6000 rpm actually can operate in excess of 9000 rpm.

Stresses from centrifugal force in a rotating wheel increase as the square of the speed. Thus, in a wheel approved for operation at 6000 rpm the breaking stresses would be increased 2¼ times if the wheel were overspeeded to 9000 rpm. This appreciable increase in the breaking stresses, when coupled with grinding and perhaps mounting stresses as well, could very well result in a serious and costly wheel failure.

**Check Speed Regularly**—Too much importance cannot be attached to regular speed checks on all types of portable grinders, whether electric, pneumatic or flexible shaft driven. The responsibility for making these checks at regular intervals must fall on the user of the machine.

Normally, the department supervisor or plant safety engineer would be in charge of this program. The important thing is to set up regular and frequent check periods, not only to determine the actual rpm of the machines as compared to their rated speeds, but also to make certain that the machine speed does not exceed the maximum safe operating speed of the grinding wheel in use.

In many cases, portable grinders are rated by the machine builder for both load and no-load speeds. From the wheel strength standpoint, the free-running speed, which is always the higher, must be considered the operating speed of the grinder.

Air pressures also play an important role in the safe operation of pneumatic type grinders. Although most operators are aware that excessive air pressures can cause overspeeding, many do not realize that subnormal pressures or lack of adequate power will cause a machine to slow down under load, with consequent loss of efficiency. This slowing down of the wheel causes it to act much softer and to break down faster; it will even set up a bumping action which, if continued, may cause the wheel to break.

An experienced operator usually can tell by the sound of his grinder if it is operating at the proper speed.

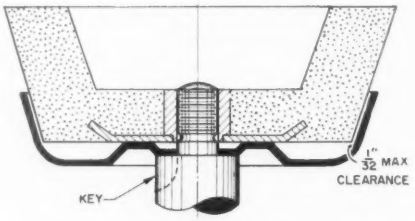



Fig. 7—Typical resinoid bonded flaring cup wheel. Prong-anchor bushing is molded into back, and heavy gage steel cup guard revolves with the wheel

In plants where the importance of proper operating speeds and the dangers set up by excessive speeds have been impressed upon the workmen, an operator himself will, when in doubt, usually insist on an immediate speed check of his grinder, thus averting the possibility of a serious wheel breakage.

**Improper Wheel Mounting**—In many shops, for reasons of convenience or economy, light-duty portable sanders designed for using reinforced resinoid hub wheels and abrasive coated fiber discs have been and still are being used on heavy grinding jobs. The weakness of this strictly disc-type grinder when used for heavy-duty grinding with a bonded abrasive cup wheel lies in the inadequacy of its back flange, which normally consists of only a ⅛ to ¼-in.-thick raised collar, usually integral with the motor shaft.

In the past, most threaded steel bushings molded into the back of resinoid or rubber bonded cup wheels have required a flat, unrelieved back flange of sufficient diameter and thickness to insure a firm and rigid support for the wheel under any normal grinding conditions.

Notwithstanding the recommendations of both the wheel and machine manufacturers, many right-angle portable grinders still are operated in a dangerous manner. Concerned with this condition, Norton Co., as a wheel manufacturer, has conducted extensive laboratory and field tests. This study, recently concluded, had a two-fold objective:

1. To provide an improved threaded steel bushing which would eliminate or at least minimize dangerous stresses set up in the wheel body through improper mounting. Also, in the case of accidental failure, the bushing itself would act to hold the pieces of the broken wheel together until the machine was stopped.

2. To provide a wheel guard which would furnish adequate operator protection in the event of accidental breakage without interfering with the operator's vision and would not add objectionable bulk or weight to the grinding machine. Equally important, a feature of this ideal guard is that it should reinforce the wheel against failure during its operation or before failure actually occurs.

**Threaded Bushing** — We decided that the prime objective of our investigation would be an improved type of threaded steel bushing molded into the back of the wheel to drive it. After exhaustive tests of available types we decided on what now is known as the pronged-anchor bushing (Fig. 3).

As pictured here, the bushing presents a solid, flat steel back which serves as a permanently molded-in back flange. This feature, in conjunction with the knurled threaded center section and the angled prongs —which are also molded into the wheel body—insures a safe, accurate

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# HERE'S REAL MATERIAL HANDLING NEWS

Cutaway showing 2-coil construction. This design provides a deeper magnet field at the center of the pulley — a pattern which conforms to normal load conditions.

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Stearns now offers a powerful new electro-magnetic pulley that provides exceptional tramp iron removal *throughout the entire load mass.* Two-coil design produces a magnetic field that is deepest at the center of the conveyor belt where load is heaviest. The area of magnetic attraction is the same general shape as the load on a conveyor operating under standard conveyor practices.

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Because of the nature of the magnetic field, smaller pulleys costing less, can now be used on jobs where larger units were formerly needed. An examination of data on a number of proposed installations showed that, in the majority of the cases, the recommended new 2-coil pulley is of smaller diameter than a 3-coil pulley handling the same job.

Get all the facts on this new magnetic pulley. Find out how it simplifies pulley selection. Write for bulletin 303-C.

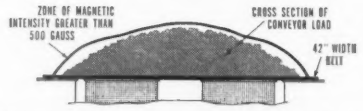


Diagram showing magnetic field for 2-coil, 36-in. dia., 42-in. wide pulley. Note how magnetic field blankets entire load.

Diagram of same size 3-coil pulley. Note how center of load extends above magnetic field. Conveyor would require a larger pulley operating at slower speed in order to do an effective tramp iron removal job.

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Because this pulley fits right into recommended conveyor standards for speed of belt travel and depth of load for various types of materials, it is far simpler to select the right pulley than ever before. Stearns provides new selection tables in Bulletin 303-C that now make it possible for you to select the right size unit for your job even before you consult our sales engineers.

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and secure mounting on the machine spindle.

Experience in the field has proved that in certain type breakages, the new bushing will hold together the pieces of an accidentally broken wheel, provided its operating speed is not excessive when the breakage occurs. Fig. 4 illustrates three popular-type flaring cup wheels which were accidentally broken in service. In each case the break is a complete one, but all pieces of the wheel were retained by the bushing until the machine was stopped.

**New Revolving Cup Guard**—We next sought an improved type of wheel guard which would team up with the new pronged-anchor bushing to afford maximum operator protection where it was impractical or impossible to employ the conventional stationary type guard.

Fig. 7 shows a typical flaring cup wheel with the new anchor-prong bushing molded into the back. Outlined in heavy black is a revolving cup guard of the type manufactured by Morrison Products Inc., Cleveland. Because of its simplicity of construction, ease of use and its positive protection features, this cup guard was selected. The selection was made only after exhaustive tests in our own laboratories and extensive use under actual plant operating conditions.

Testing procedure in our laboratories consisted of mounting (6-4¾) x 2½ x ⅝-in. 11 NCRH resinoid bonded flaring cup wheels, with the revolving cup guard in place, on special speed testing machines. The assembly then was rotated at speeds well above the bursting speeds of the wheels used. No breakage resulted, indicating that the cup guard did reinforce the wheel against breakage before it actually occurred.

In a further test the rim sections of similar wheels were slotted radially to induce failure at 6000 rpm, which is considered the safe operating speed range for 6-in.-diam resinoid cup wheels of this type. The slotted rim wheels were then mounted with the revolving cup guards in place and were speed tested to bursting. In every case, the cup guard retained all pieces of the broken wheel.

Fig. 5 shows three of the slotted rim test wheels exactly as they appeared when removed from the speed test machine, after breakage had occurred. These wheels were picked at random from many tested. Fig. 6 shows the same wheels with the revolving cup guard removed, clearly showing that the cup guards in conjunction with the anchor-prong bushing did hold the loose pieces together after breakage had occurred.

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tection was achieved with no appreciable increase in machine weight, no interference with the operator's vision and without the addition of any movable parts which might require adjustment as the wheel wears down. Once the assembly is mounted, it needs no further attention throughout the life of the wheel.

It would appear that this combination of pronged-anchor bushing and revolving cup guard furnishes easily applied and completely adequate protection in this field of portable grinding.

Editor's Note: Copyright 1954 by Norton Co., Worcester, Mass., and published in the November, 1954, issue of its publication, *Grits and Grinds*.

## New Economic Legislation and Tendencies Are Discussed

Suggestions as to how controllers and others concerned with corporate finance can take advantage of indicated trends, and benefits offered by new legislation and rulings and the activities of government agencies are given in "Sharing In Our Expanding Economy," published by American Management Association, 330 West 42nd St., New York 36. Topics discussed include the economic outlook, 1954 revenue act, trend of interest rates and financing foreign operations. The 35-page booklet is priced at $1.75 ($1 to AMA members).

## Training Booklet Offered

Training of both plant and supervisory personnel is discussed in the booklet, "How To Train," published by Wheeler Associates Inc., 15017 Detroit Ave., Cleveland 7. When to train, who should be trained, what to teach and who should do the training are explained. The various steps in a training program are outlined. The booklet, fourth in a series on cost reduction for industrial plant management, is available upon request.

## Book Review

*Engineering Metallurgy*, by Dr. E. M. H. Lips, cloth, 250 pages, 6 x 9 in., published by N. V. Philips Gloeilampenfabrieken, Eindhoven, Netherlands. Price $6.25.

Study of metals in relationship with present day construction techniques features this volume written for both the metallurgist and the practical engineer. Mechanical properties, corrosion, phase diagrams, alloys of iron, nonferrous metals, heat treatment and the working and joining of metals are discussed. Explanation is aided by 170 illustrations and 56 tables.

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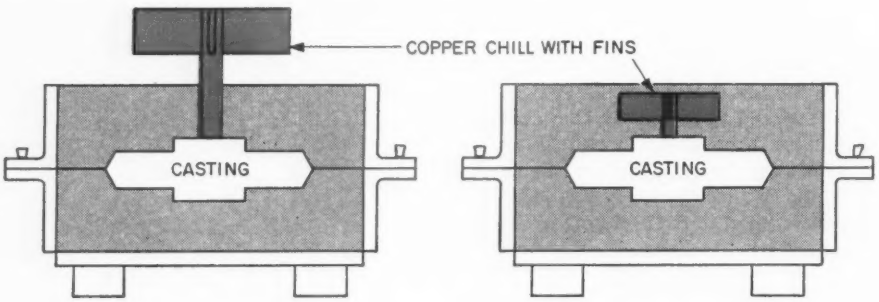
By C. W. AMMEN



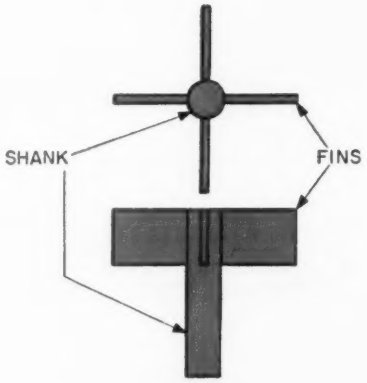




Fig. 1—Copper chill with cooling fins ordinarily is used in permanent molds, but also works well in green sand, either exposed or unexposed

# Use of Foundry Chills

DEAR CHARLIE:

We have a job in the shop which is giving us quite a time. It's the side member of a small roll-forming machine, and the castings are made in pairs. Between cored holes, which later will be bored for the bearings, there's a section which is pocketed off. It's an abrupt change in section and very heavy in respect to the remainder of the casting. This spot wants to shrink. It is impossible to put a riser on it that can be removed, and we know we couldn't get enough riser on it to do much good. We have orders for these parts in both gray iron and high-tensile aluminum. Have tried using chills in place of cores, but have trouble removing them. Know any way to remove them easily?

What type of external chill would you suggest which would do the most chilling on a small contact point? Is it possible to get away with an internal chill in aluminum?

Sincerely,
SAM

DEAR SAM:

I think I know what you're up against, even in the absence of a sketch or section. No doubt you proposed a redesign for a better and more practical casting to your customer and drew a blank there. Every now and then we all come across these jobs and wonder what the gink who designed it was thinking about when it was on the board. Only too often the principles of controlled directional solidification are ignored completely by designers and engineers.

From time to time you will encounter castings with sections that cannot be reached by properly located risers and must have their solidification rate controlled to conform with that of other sections which can be fed properly. But one on which it's hard even to place a chill properly is a real problem.

I came across a job in a small shop in Alabama some time back which had a fenced-off section which wanted to shrink. The old boy had it licked with a copper chill with cooling fins which did a very nice job. This type of chill usually is used in permanent molds when one section of the casting requires such treatment. But this type of chill works well in green sand, either exposed or unexposed, as is shown in Fig. 1.

Another chill that sometimes will do the trick is a chill with a square, round or wedge-shaped head on it (Fig. 2).

To remove a chill used in place of a core, you might try chills made from Ni-Resist, an austenitic iron containing about 6 per cent Cu and 14 per cent Ni. Ni-Resist manufacture is covered by patents and is produced under a license. Because Ni-Resist has a higher coefficient of expansion than cast iron and expands rapidly when subjected to heat, it usually can be removed easily when the casting is cool, since it is loose. Or you can coat the chiller with linseed or core oil, roll it in silica flour and bake it dry. These chills can be knocked out with little effort. Also, try a chill split diametrically two ways, with the slots or splits filled in with thin sheet asbestos. This design gives the effect of an expanding mandrel and facilitates removal.

If the cored holes are straight and close enough to your affected area to chill enough, you can use a helix spring of the proper diameter, rolled in core sand, baked and sanded down on the outside to the spring or coil. The coil can be removed very easily from the casting and the hole can be bored. This method of chilling a cored hole is very effective and also can be used where a core of small di-

Fig. 2—Use chills with round, square or wedge-shaped heads

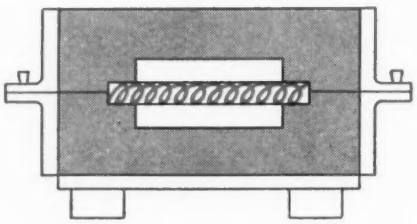


Fig. 3—Chill coil was left in since hole was used as waterway

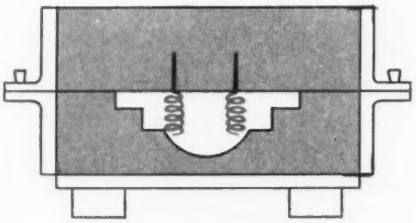
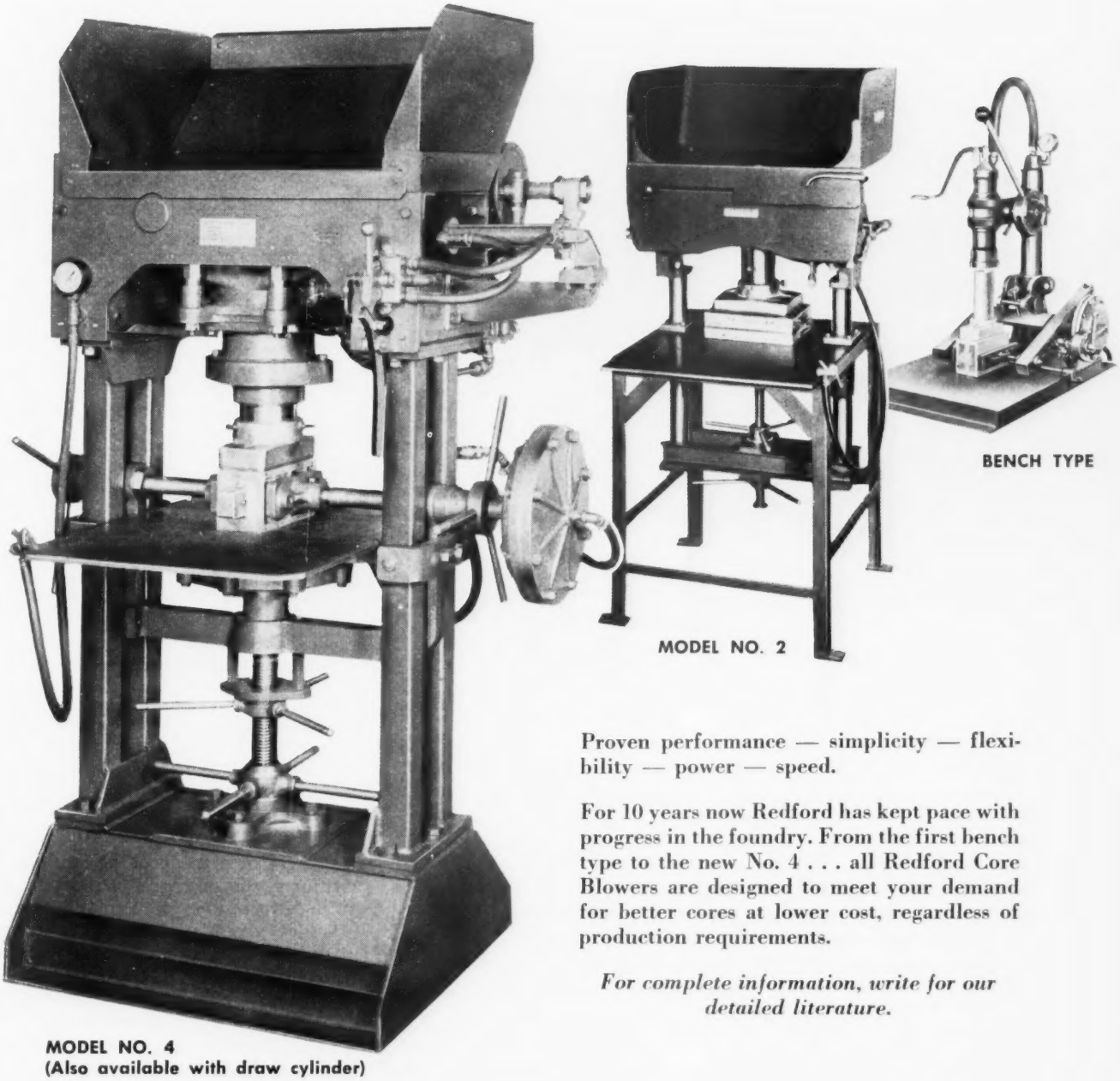


Fig. 4—Chill coils rolled in core sand also can remove metal

# Redford CORE BLOWERS



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ameter runs for considerable length and wants to bend or break.

I once had to make some zinc sticks which were 2 in. OD, ½ in ID and 9½ in long. Successful cores were made by placing a ⅛-in. core wire through a spring which had a ½-in. ID and was 9½ in. long plus prints. The spring was wound with a one-wire diameter spacing. The spring with the ⅛-in. wire inside is simply rolled in oil sand core mix and put on a flat plate to dry. After drying, the outside is sanded down to the spring, giving a nice strong core.

Ordinarily, the core wire is not exposed when these springs with ⅛-in. wire in them are rolled in core sand. Should the wire show after the core is cleaned and ready for use, the exposed surface can be touched with a little core coating. If you wish to insert the wire after rolling the spring in core sand, you should reroll the spring. This will tighten the sand which has been disturbed by inserting the wire, which has a tendency to push the sand out from between the turns. A little practice will prove it to be a real simple and fast operation worth the trouble it takes.

In this case we did not remove the spring since the hole was used for a waterway, Fig. 3, but it can be removed readily by pulling one end. I have seen chill coils, rolled in core sand and sanded, used to chill and at the same time to remove metal from the backs of cast pattern halves which were to be mounted on match-plates, making them lighter (Fig. 4). These coils can be purchased in a large variety of sizes.

Chill coil nails can be had coated or plain; pointed or not pointed; open or closed; straight, with or without double tails; and flat. Many other types of chills in various forms and in a wide range of sizes also are available.

Some core washes tend to affect a mild chill, but I saw a job once being chilled with what the molder called his liquid chill. It was a mixture of grindings and molasses with which the area to be chilled was slicked down and dried. Both the core and green sand were treated this way.

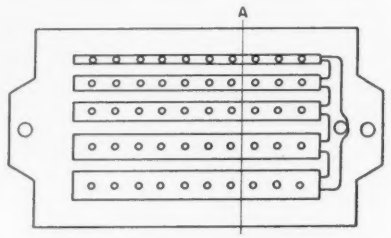
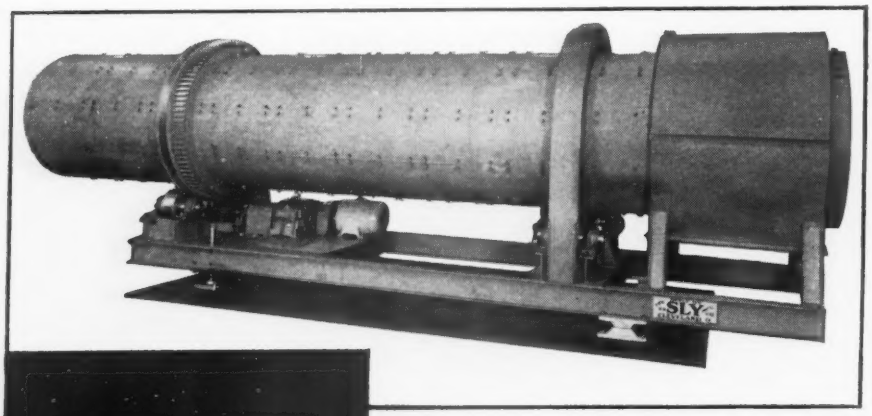



Fig. 5—Simple equipment for making chills for internal use in aluminum consists of match-plate with a series of solid rounds of various diameters on it. Bottom, casting can be cut to produce any section desired

I have tried this procedure in brass with varying degrees of success. I also have dusted grindings on a section of green sand with a parting bag and have slicked down with a double ender with some success. At any rate, liquid chill coating will give you something to think about.

The use of zircon sand mixes and zircon washes will assist in the promotion of a chill. Zircon is a silicate mineral of the element zirconium. The heat diffusivity coefficient is somewhere near twice that of silica, making zircon a very useful tool as a chill for controlling directional solidification. In addition, the refractoriness, fine grain size, and chemical inertness produce an exceptionally clean

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surface with little or no expansion scabs, etc. The thermal expansion is somewhat less than one-third that of silica.

Two mixes in use with very good results are the following: *Gray Iron Cores*—25 gal zircon, 10 qt graphite, 6 qt silica flour, 4 qt core oil, and water to temper; *Non-ferrous cores*—40 parts zircon and 1 part core oil. Coat with a wash made from zircon flour or add zircon flour to your present wash for both gray iron and non-ferrous. You will note the use of graphite in the gray iron core mix. This is to promote a reducing atmosphere to prevent burn-in.

Zircon molding or facings usually are made by substituting zircon sand for all or part of the silica in the mix being used. A popular mix is 50 per cent of each: 28 qt silica, 28 qt zircon, 1 qt bentonite and 1 qt cereal.

Silicon carbide grain, metallic shot and grit mixed in the molding medium also will promote chill.

### Carbide Is Stabilized

I might add at this point that with your gray iron castings, the cores and the mold section in contact with portion of the casting you desire to chill or to control the solidification may be coated with a wash or paste made of tellurium powder. Tellurium is a very potent carbide stabilizer, and usually only small amounts are needed. Tellurium paint on cores and molds in gray iron practice promotes a more rapid cooling or densification through the reaction between molten Fe and Te.

The practice of mixing grindings or filings with the green sand which is tucked between and around the teeth of a cast tooth gear is very common among oldtimers. It tends to prevent burn-in between the teeth and results in a mild chilling action. When properly done, it produces a nice, clean casting in and around the teeth. The practice is to throw the sand into the teeth with a whipping motion, then to tuck when you have gone all the way around. Sand mixed with filings will not flow very readily and should be used with care to prevent ramoffs. This type of sand mixed with cast iron or brass and packed around a boss which wants to shrink, for example, often will solve the trouble.

Internal chilling of aluminum is no trick at all, but first get the OK from your customer. It should be used only where it will not affect the strength, not where you are going to machine into it. Internal chilling of aluminum is practiced by some makers of pressure cast matchplates and also is very effective in gravity cast plates, loose patterns and nonstressed castings. The equipment to make internal chills for aluminum with a variety of sections and spacing which would require a number of sizes and lengths of chills is simple and very useful. This type of chill might be permissible and might do the trick for you, Sam.

One of the most popular and simple pieces of equipment for making chills for internal use in aluminum consists of a matchplate (Fig. 5) with a series of solid rounds of various diameters on it. Holes are drilled through the patterns and plate along the patterns on ½-in. centers ⅛ to ¼ in. in diameter, depending on the size of the round. The molds are made in the usual manner with the exception that after the cope is removed, prior to removing the pattern, a tool such as a vent wire or ice pick is pushed through the holes in the patterns. It should penetrate into the drag far enough to give the resulting castings a series of points along their length which are used to anchor the chills where needed.

Some prefer simply to place small points on the drag side of the pat-

Sly Convectioneered Box Oven at plant of American Crucible Products Co., Lorain, Ohio, a pioneer in the field of high lead, bronzes and babbitts and maker of Promet Bronzes.

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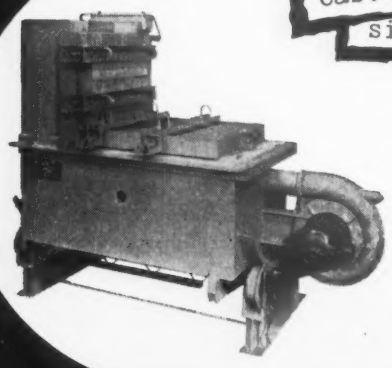

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terns, to locate where to pierce the drag with the wire or pick. The solid sticks can be cut with a bandsaw to give any length or size of chill, from a very narrow one with one anchor pin to a large one with several anchor pins. These provide an internal chill very similar to spider chills.

When an external chill is used, the coating is of secondary importance. The most important thing is that the chill be dry and clean. Chills larger than 1 sq in. in area should be scored or provided with a small hole in the center to allow for the escape of gas. Chills which are very large should be drilled with holes ¾ in. in diam and 1¼-in. centers, filled with sand and baked before using. Chills can be coated with a thin coat of linseed oil, chalk, thin molasses water and plumbago, thinly applied shellac, kerosene oil and plumbago. It also is very important that molds containing chills be filled as rapidly as possible. Slow pouring causes the chill to condensate moisture and increases the chance of blows.

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According to the publishers, this is the first complete book ever published on reinforced plastics and contains information important to all concerned with the subject matter. Written for the design engineer and executives in materials industries, the book covers in detail the resins and glass reinforcements used in reinforced plastics, molding techniques, inspection and testing, properties, and design considerations. Two special chapters contributed by leaders in engineering research discuss the theory and fundamental concepts of reinforced plastics and design from the viewpoint of the structural engineer.

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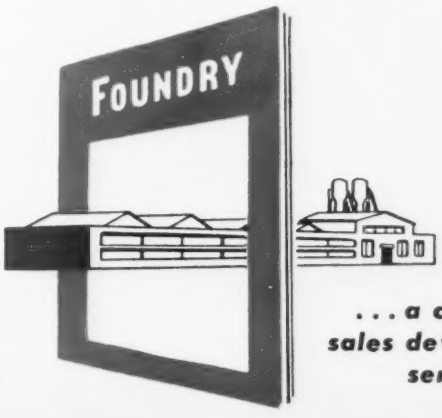


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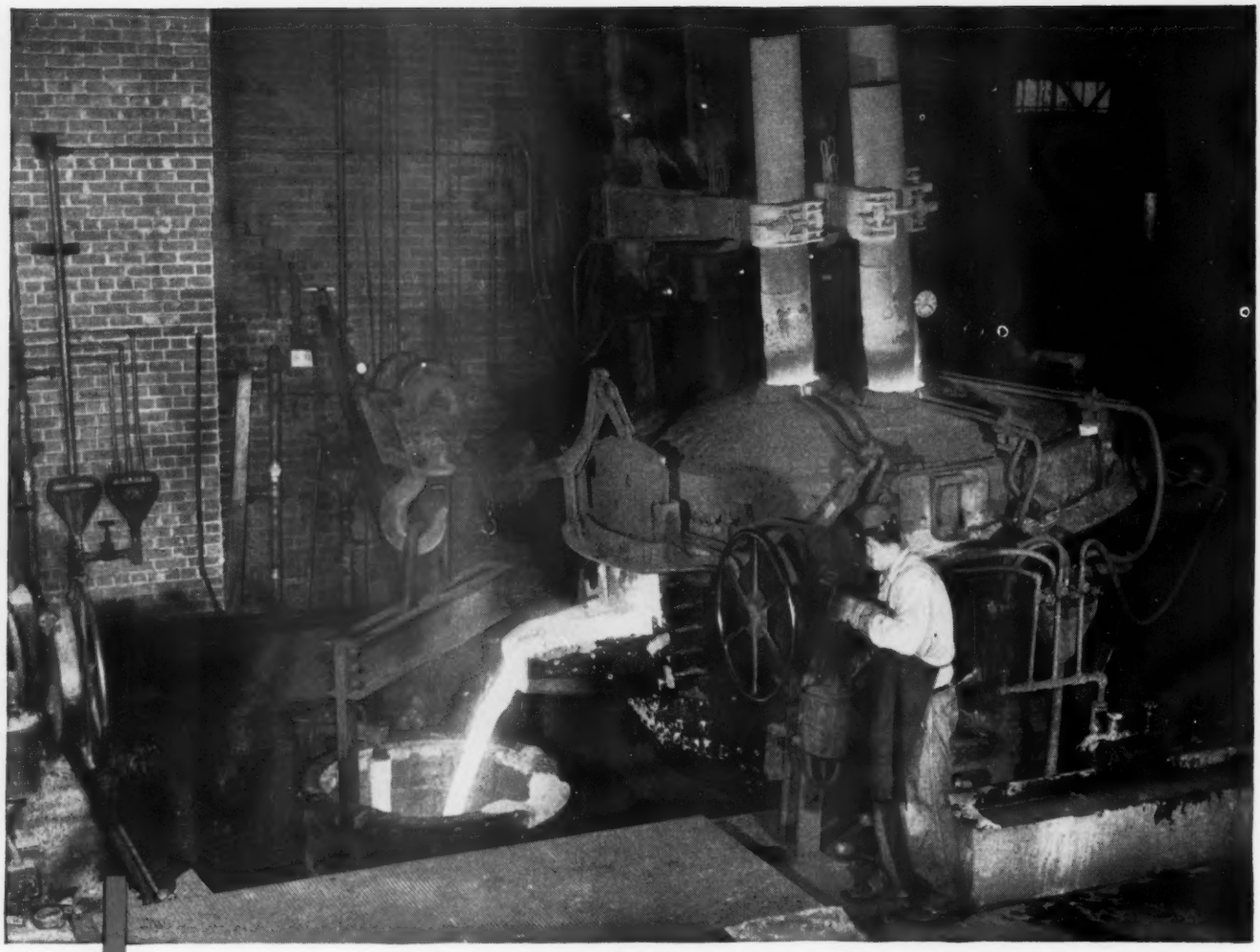

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# Outside Diameters for the Scribing of Polygons

In laying out and making patterns many cases occur where squares, hexagons or octagons must be scribed. The first step in this operation is to lay out a circle of proper diameter inside of which the polygon may be constructed. The accompanying tables give the proper diameters for these circles for polygons ranging from 1-16 to 6 inches across flats.

| Distance across flats, inches | Dia. for squares, inches | Dia. for hexagons, inches | Dia. for octagons, inches | Distance across flats, inches | Dia. for squares, inches | Dia. for hexagons, inches | Dia. for octagons, inches |
|---|---|---|---|---|---|---|---|
| 1/16 | 3/32 | 5/64 | 1/16 | 1 5/16 | 1 55/64 | 1 33/64 | 1 37/64 |
| 1/8 | 11/64 | 9/64 | 9/64 | 1 3/8 | 1 15/16 | 1 19/32 | 1 31/64 |
| 3/16 | 17/64 | 7/32 | 13/64 | 1 7/16 | 2 1/32 | 1 21/32 | 1 9/16 |
| 1/4 | 23/64 | 9/32 | 17/64 | 1 1/2 | 2 1/8 | 1 47/64 | 1 5/8 |
| 5/16 | 7/16 | 23/64 | 11/32 | 1 9/16 | 2 13/64 | 1 51/64 | 1 11/16 |
| 3/8 | 17/32 | 7/16 | 13/32 | 1 5/8 | 2 19/64 | 1 7/8 | 1 43/64 |
| 7/16 | 5/8 | 1/2 | 15/32 | 1 11/16 | 2 25/64 | 1 61/64 | 1 53/64 |
| 1/2 | 45/64 | 27/64 | 25/64 | 1 3/4 | 2 15/32 | 2 1/64 | 1 57/64 |
| 9/16 | 51/64 | 31/64 | 29/64 | 1 13/16 | 2 9/16 | 2 3/32 | 1 31/32 |
| 5/8 | 57/64 | 33/64 | 1/2 | 1 7/8 | 2 31/32 | 2 11/64 | 2 1/32 |
| 11/16 | 31/32 | 41/64 | 3/4 | 1 15/16 | 2 47/64 | 2 15/64 | 2 3/32 |
| 3/4 | 1 1/16 | 25/64 | 19/32 | 2 | 2 53/64 | 2 5/16 | 2 11/64 |
| 13/16 | 1 5/32 | 15/16 | 7/8 | 2 1/16 | 2 59/64 | 2 3/8 | 2 15/64 |
| 7/8 | 1 13/64 | 1 1/64 | 29/32 | 2 1/8 | 3 | 2 29/64 | 2 19/64 |
| 15/16 | 1 21/64 | 1 5/64 | 1 1/64 | 2 3/16 | 3 3/32 | 2 17/32 | 2 3/8 |
| 1 | 1 27/64 | 1 5/32 | 1 5/64 | 2 1/4 | 3 3/8 | 2 19/32 | 2 7/16 |
| 1 1/16 | 1 1/2 | 1 13/64 | 1 5/32 | 2 5/16 | 3 47/64 | 2 43/64 | 2 1/2 |
| 1 1/8 | 1 19/32 | 1 19/64 | 1 7/32 | 2 3/8 | 3 53/64 | 2 3/4 | 2 51/64 |
| 1 3/16 | 1 1/16 | 1 3/8 | 1 9/32 | 2 7/16 | 3 29/32 | 2 13/16 | 2 25/64 |
| 1 1/4 | 1 43/64 | 1 7/16 | 1 13/64 | 2 1/2 | 3 17/32 | 2 27/64 | 2 13/32 |

| Distance across flats, inches | Dia. for squares, inches | Dia. for hexagons, inches | Dia. for octagons, inches | Distance across flats, inches | Dia. for squares, inches | Dia. for hexagons, inches | Dia. for octagons, inches |
|---|---|---|---|---|---|---|---|
| 2 9/16 | 3 5/8 | 2 21/64 | 2 29/32 | 4 5/16 | 6 3/32 | 4 33/64 | 4 43/64 |
| 2 5/8 | 3 23/32 | 3 1/32 | 2 37/32 | 4 3/8 | 6 5/16 | 5 3/64 | 4 47/64 |
| 2 11/16 | 3 51/64 | 3 7/64 | 2 39/32 | 4 7/16 | 6 9/32 | 5 1/8 | 4 51/64 |
| 2 3/4 | 3 57/64 | 3 11/64 | 2 43/64 | 4 1/2 | 6 23/64 | 5 13/64 | 4 7/8 |
| 2 13/16 | 3 63/64 | 3 1/4 | 3 3/64 | 4 9/16 | 6 27/64 | 4 17/64 | 4 15/16 |
| 2 7/8 | 4 1/16 | 3 5/16 | 3 7/64 | 4 5/8 | 6 33/64 | 5 1/32 | 5 1/64 |
| 2 13/16 | 4 5/32 | 3 25/64 | 3 11/64 | 4 11/16 | 6 37/64 | 5 13/32 | 5 5/64 |
| 3 | 4 1/4 | 3 15/32 | 3 1/4 | 4 3/4 | 6 43/64 | 5 21/64 | 5 9/64 |
| 3 1/16 | 4 7/64 | 3 17/32 | 3 5/16 | 4 13/16 | 6 47/64 | 5 9/16 | 5 13/64 |
| 3 1/8 | 4 27/64 | 3 39/64 | 3 3/8 | 4 7/8 | 6 53/64 | 5 5/8 | 5 9/32 |
| 3 3/16 | 4 1/2 | 3 1/8 | 3 27/64 | 4 15/16 | 6 63/64 | 5 41/64 | 5 11/32 |
| 3 1/4 | 4 19/32 | 3 3/4 | 3 31/64 | 5 | 7 5/64 | 5 47/64 | 5 13/32 |
| 3 5/16 | 4 11/16 | 3 53/64 | 3 37/64 | 5 1/16 | 7 5/32 | 5 53/64 | 5 31/64 |
| 3 3/8 | 4 49/64 | 3 27/32 | 3 41/64 | 5 1/8 | 7 1/4 | 5 29/32 | 5 35/64 |
| 3 7/16 | 4 29/32 | 3 31/32 | 3 43/64 | 5 3/16 | 7 11/32 | 5 63/64 | 5 37/64 |
| 3 1/2 | 4 61/64 | 4 3/64 | 3 25/32 | 5 1/4 | 7 27/64 | 6 1/16 | 5 11/16 |
| 3 9/16 | 5 1/32 | 4 7/64 | 3 53/64 | 5 5/16 | 7 33/64 | 6 3/64 | 5 3/4 |
| 3 5/8 | 5 1/8 | 4 7/16 | 3 59/64 | 5 3/8 | 7 19/32 | 6 13/64 | 5 13/16 |
| 3 11/16 | 5 7/32 | 4 37/64 | 3 63/64 | 5 7/16 | 7 11/16 | 6 9/32 | 5 27/64 |
| 3 3/4 | 5 19/64 | 4 21/64 | 4 1/16 | 5 1/2 | 7 35/64 | 6 11/32 | 5 29/64 |
| 3 13/16 | 5 23/64 | 4 13/32 | 4 1/8 | 5 9/16 | 7 53/64 | 6 37/64 | 6 1/64 |
| 3 7/8 | 5 31/64 | 4 15/32 | 4 7/16 | 5 5/8 | 7 61/64 | 6 1/2 | 6 3/32 |
| 3 15/16 | 5 9/8 | 4 39/64 | 4 17/64 | 5 11/16 | 8 3/64 | 6 9/16 | 6 5/32 |
| 4 | 5 31/32 | 4 5/8 | 4 21/64 | 5 3/4 | 8 1/8 | 6 41/64 | 6 7/32 |
| 4 1/16 | 5 3/4 | 4 11/16 | 4 25/64 | 5 13/16 | 8 7/32 | 6 33/32 | 6 19/64 |
| 4 1/8 | 5 53/64 | 4 43/64 | 4 15/32 | 5 7/8 | 8 15/64 | 6 25/32 | 6 23/64 |
| 4 3/16 | 5 59/64 | 4 23/32 | 4 17/32 | 5 15/16 | 8 35/64 | 6 55/64 | 6 27/64 |
| 4 1/4 | 6 1/64 | 4 29/32 | 4 19/32 | 6 | 8 31/64 | 6 59/64 | 6 1/2 |

# Determining the Length of Sides of Polygons

Tables presented in the preceding Data Sheet give the correct diameters for circles circumscribing squares, hexagons and octagons of various sizes ranging from 1-16 to 6 inches across flats. In order to lay out these polygons on a pattern with a pair of dividers it is necessary also to know the length of one side of the polygon. These data are given in the accompanying tables.

| Distance across flats, inches | Length for squares, inches | Length for hexagons, inches | Length for octagons, inches |
|---|---|---|---|
| 1/16 | 1/16 | 1/32 | 1/32 |
| 1/8 | 1/8 | 1/64 | 1/64 |
| 3/16 | 3/16 | 3/64 | 3/64 |
| 1/4 | 1/4 | 1/64 | 1/64 |
| 5/16 | 5/16 | 5/64 | 1/8 |
| 3/8 | 3/8 | 3/32 | 5/64 |
| 7/16 | 7/16 | 1/4 | 7/64 |
| 1/2 | 1/2 | 9/32 | 13/64 |
| 9/16 | 9/16 | 21/64 | 15/64 |
| 5/8 | 5/8 | 23/64 | 17/64 |
| 11/16 | 11/16 | 25/64 | 9/32 |
| 3/4 | 3/4 | 7/16 | 5/16 |
| 13/16 | 13/16 | 15/32 | 1/2 |
| 7/8 | 7/8 | 1/2 | 33/64 |
| 15/16 | 15/16 | 33/64 | 35/64 |
| 1 | 1 | 17/32 | 19/32 |
| 1 1/16 | 1 1/16 | 9/16 | 37/64 |
| 1 1/8 | 1 1/8 | 19/32 | 39/64 |
| 1 3/16 | 1 3/16 | 5/8 | 41/64 |
| 1 1/4 | 1 1/4 | 21/32 | 43/64 |
| 1 5/16 | 1 5/16 | 11/16 | 45/64 |
| 1 3/8 | 1 3/8 | 23/32 | 3/4 |
| 1 7/16 | 1 7/16 | 3/4 | 25/32 |
| 1 1/2 | 1 1/2 | 25/32 | 13/16 |
| 1 9/16 | 1 9/16 | 13/16 | 27/32 |
| 1 5/8 | 1 5/8 | 27/32 | 7/8 |
| 1 11/16 | 1 11/16 | 7/8 | 29/32 |
| 1 3/4 | 1 3/4 | 29/32 | 15/16 |
| 1 13/16 | 1 13/16 | 15/16 | 31/32 |
| 1 7/8 | 1 7/8 | 31/32 | 1 |
| 1 15/16 | 1 15/16 | 1 | 1 1/32 |
| 2 | 2 | 1 1/32 | 1 1/16 |
| 2 1/16 | 2 1/16 | 1 1/16 | 1 3/32 |
| 2 1/8 | 2 1/8 | 1 3/32 | 1 1/8 |
| 2 3/16 | 2 3/16 | 1 1/8 | 1 5/32 |
| 2 1/4 | 2 1/4 | 1 5/32 | 1 3/16 |
| 2 5/16 | 2 5/16 | 1 3/16 | 1 7/32 |
| 2 3/8 | 2 3/8 | 1 7/32 | 1 1/4 |
| 2 7/16 | 2 7/16 | 1 1/4 | 1 9/32 |
| 2 1/2 | 2 1/2 | 1 9/32 | 1 5/16 |
| 2 9/16 | 2 9/16 | 1 5/16 | 1 11/32 |
| 2 5/8 | 2 5/8 | 1 11/32 | 1 3/8 |
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| 5 15/16 | 5 15/16 | 3 1/32 | 3 1/16 |
| 6 | 6 | 3 1/16 | 3 3/32 |

# Lakey Foundry saves 112 man-hours per shift in core handling with three 2000-lb. Clarks

Handling finished cores, from baking ovens either to core storage or direct to the molding line used to require 23 men using hand dollies; and stacking was done manually. Now, says Jim Wilson, Methods Engineer, three operators on Clark 2000-lb. trucks with six helpers, do a far better job with a reduction of 112 man-hours per 8-hour shift. "That's nice money!" is Jim Wilson's understatement.

Foundries are a particularly "happy hunting ground" for cost-minded executives armed with Clark fork trucks: on the alert for faster, safer, cheaper ways to handle sand, scrap, cores, molds, castings—all the many handling jobs that make up a foundry's production cycle.

How about some good hunting in your own plant? There's an expert guide available — the Clark dealer: thoroughly competent to analyze your materials handling needs and to devise a plan to satisfy them. He's listed in your directory's Yellow Pages.

**HOW LAKEY USES THREE CLARK TRUCKS**

| | |
|---|---|
| **Production:** | 10,000 cores per day from 4 core lines and 4 ovens; grey iron castings chiefly for engine blocks and housings for industrial, agricultural and earth-moving machinery. |
| **Sizes & Wts.:** | 10"-30" high, cores 12 to 100 lbs. each. |
| **Handling Equipment:** | 3 Clark 2000-lb. trucks, 36" x 48" plywood and metal pallets, hydraulic load stabilizers with 1" sponge-rubber facing, to hold cores firmly and compensate for varying heights. |
| **Unit Loads:** | range from 800 lbs. to 1600 lbs. |
| **Storage:** | Palletized units tiered to 15 ft. height; neat rows conserve storage space, simplify removal of cores, promote good-housekeeping. |

**Industrial Truck Division**
**CLARK EQUIPMENT COMPANY**
**Battle Creek 16, Michigan**

CLARK EQUIPMENT

## Look at the load carried by these four NEFF & FRY Bins

All of the bridgework, with machinery, atop these bins is carried by the silos themselves without extra supports. What's more, the four bins, if filled, can hold about 3,000 tons of coal.

This strikingly proves the load-bearing strength of NEFF & FRY storage bins, which is due to the design and stamina of the Super-Concrete Staves in the walls.

Our bins are used in the industrial areas of North America for handling and storing a great variety of flowable bulk materials, the most frequent being alumina, cement, clay, coal, ore, lime, grain, sand, and wood chips.

The facts about NEFF & FRY bins are briefly told in our interesting folder, "Bins With the Strength of Pillars." A copy is yours for the asking without obligation.

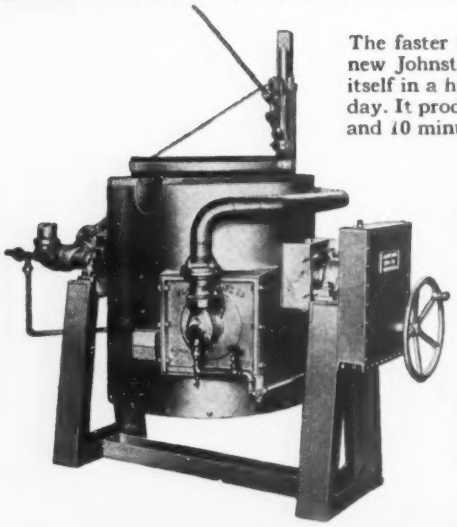
**THE NEFF & FRY CO. • 214 Elm St., • Camden, Ohio**

*Not exported except to Canada and Mexico.*

**SUPER-CONCRETE STAVE STORAGE BINS**

**NEW FURNACE—**

**Melts 1200 Lbs. of Brass IN 1 Hour, 10 Minutes!**



The faster the furnace—the lower your cost. The new Johnston No. 400 Crucible Furnace pays for itself in a hurry by hustling more heats into every day. It produces 1200 lbs. of molten brass in 1 hour and 10 minutes on successive heats, gas fired (may also be oil fired as is model shown). Johnston burners, blowers and experienced engineering combine to produce unusual speed with economically low fuel consumption.

A new enclosed tilting mechanism makes tilting easier than ever before and it may be electrically driven.

Crucible life and lining life are extremely good. Trunions are adjustable for best balance and are supported on large pillow block bearings. A simple, convenient cover lifting mechanism is operated from the front of the furnace.

*WRITE FOR CATALOG 223F*

**OVER THIRTY YEARS EXPERIENCE IN THE DESIGN AND MANUFACTURE OF INDUSTRIAL HEATING EQUIPMENT**

THE JOHNSTON LINE — SAFETY — DEPENDABILITY

**JOHNSTON** MANUFACTURING CO.
2825 EAST HENNEPIN AVE.
MINNEAPOLIS 13, MINN.

ENGINEERS & MANUFACTURERS OF INDUSTRIAL HEATING EQUIPMENT

# Meditations of a Sandman

By HAROLD S. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

## "Of Men and Mullers"

DESPITE the prevalence of contrary opinion, your man at the muller may be quite capable of constructive meditation. Beneath his professional make-up of bentonite, seacoal and pitch-dust, he could quite conceivably be contemplating (with some degree of frustration) that foundry mystery, a "sand-mix." Yes indeed, our sandman is daily exposed to, and influenced by, an endless stream of theories, born variously of laboratory experience or rule of thumb.

He (the muller-man) listens in rapt attention to the instructions of men presumably far wiser than himself, then proceeds to follow orders. Assuming that he has normal intelligence, he will try conscientiously to follow the course that has been plotted. Having acquired the habit of eating, both he and his family are loathe to change this long-established custom. In addition to this impelling force, he may (believe it or not) be actuated by a desire to do a better job than his predecessor—to deliver all or more than the boss expects or pays for.

Let us assume further that this muller-man of yours can read the printed word with some understanding of an entire sentence, or even a paragraph, if the language is not too technical or involved. If they are, the fault may lie with the author, not with your sandman.

You might even take the trouble to explain to him some of the technical values as well as the absurdities which are sometimes found in the printed word. If he asks a sufficient number of questions concerning the articles you give him to read, and if you observe that excited, inquisitive gleam in his eye (or both of 'em), believe me, you have a human investment in your sand system that will far outweigh the cost of your equipment and materials.

Our old friend Charlie Schureman once observed that some foundry owners paid their skilled mechanics premium wages, then hired low-paid,

*Dear Reader:*

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● For further information on helpful literature, trade publications, and new equipment descriptions, please refer to IDEAS FOR FOUNDRYMEN insert and return cards on page 221.

**FOUNDRY Readers Service**

FIRST CLASS
PERMIT No. 36
(Sec. 34.9 P.L.&R.)
Cleveland, Ohio

**BUSINESS REPLY CARD**
No Postage Stamp Necessary if Mailed in the United States

4c POSTAGE WILL BE PAID BY—

**FOUNDRY**
**Penton Building**
**Cleveland 13, Ohio**

*Readers Service Dept.*

**APRIL 1955**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| IFC | 28 | 56 | 82-83 | 164 | 194-5 | 227 | 253 | 270R1 |
| 1 | 29 | 57 | 84 | 165 | 196 | 228 | 254T | 270R2 |
| 2 | 30 | 58-59 | 85 | 166T | 197 | 229 | 254B | 270R3 |
| 3 | 31 | 60 | 86 | 166B | 198 | 230 | 257 | 270R4 |
| 4-5 | 32 | 61 | 87 | 167 | 199 | 231 | 258T | 271T |
| 6-7 | 35 | 62 | 88 | 168 | 200 | 232 | 258B | 271BL |
| 8 | 36 | 63 | 129 | 169T | 201 | 233 | 259L | 271BR |
| 9 | 37 | 64 | 131 | 169B | 202 | 234 | 259R | 272T |
| 10 | 38 | 65 | 133 | 170-1 | 203 | 235 | 260 | 272BL |
| 11 | 39 | 66 | 134 | 172 | 204-5 | 236L | 261 | 272BR |
| 12 | 40-41 | 67 | 137 | 173 | 206 | 236R | 262L | 273TL |
| 13 | 42 | 68 | 139 | 174 | 207 | 237 | 262R | 273BL |
| 14 | 43 | 69 | 141 | 177 | 208 | 239 | 263T | 273R |
| 15 | 44-45 | 70 | 142 | 178 | 209T | 241 | 263B | 274TL |
| 16-17 | 46 | 71 | 145 | 181 | 209B | 242 | 264L | 274R1 |
| 18 | 47 | 72 | 147 | 182L | 210 | 243L | 264BR | 274R2 |
| 19 | 48 | 73 | 149 | 182R | 211 | 243R | 265 | 284TL |
| 20 | 49 | 74 | 150 | 183 | 214 | 245 | 267TL | 284BL |
| 21 | 50 | 75 | 153 | 184 | 217 | 246 | 267BL | 284TR |
| 22-23 | 51 | 76-77 | 154 | 185 | 220 | 247 | 267R | 284BR |
| 24 | 52 | 78 | 156 | 190 | 223 | 248T | 269TL | 287R |
| 25 | 53 | 79 | 158 | 191 | 224 | 248B | 269BL | 288 |
| 26 | 54 | 80 | 160-1 | 192 | 225 | 249 | 269R | IBC |
| 27 | 55 | 81 | 163 | 193 | 226 | 250 | 270L | OBC |

THIS CARD VALID FOR USE IN UNITED STATES AND CANADA ONLY

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TITLE _____

COMPANY _____

ADDRESS _____

CITY & STATE _____

*This card MUST be completely filled out. Please TYPE or PRINT*

**APRIL 1955**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| IFC | 28 | 56 | 82-83 | 164 | 194-5 | 227 | 263 | 270R1 |
| 1 | 29 | 57 | 84 | 165 | 196 | 228 | 264T | 270R2 |
| 2 | 30 | 58-59 | 85 | 166T | 197 | 229 | 264B | 270R3 |
| 3 | 31 | 60 | 86 | 166B | 198 | 230 | 267 | 270R4 |
| 4-5 | 32 | 61 | 87 | 167 | 199 | 231 | 268T | 271T |
| 6-7 | 35 | 62 | 88 | 168 | 200 | 232 | 268B | 271BL |
| 8 | 36 | 63 | 129 | 169T | 201 | 233 | 269L | 271BR |
| 9 | 37 | 64 | 131 | 169B | 202 | 234 | 269R | 272T |
| 10 | 38 | 65 | 133 | 170-1 | 203 | 235 | 260 | 272BL |
| 11 | 39 | 66 | 134 | 172 | 204-5 | 236L | 261 | 272BR |
| 12 | 40-41 | 67 | 137 | 173 | 206 | 236R | 262L | 273TL |
| 13 | 42 | 68 | 139 | 174 | 207 | 237 | 262R | 273BL |
| 14 | 43 | 69 | 141 | 177 | 208 | 239 | 263T | 273R |
| 15 | 44-45 | 70 | 142 | 178 | 209T | 241 | 263B | 274TL |
| 16-17 | 46 | 71 | 145 | 181 | 209B | 242 | 264L | 274R1 |
| 18 | 47 | 72 | 147 | 182L | 210 | 243L | 264BR | 274R2 |
| 19 | 48 | 73 | 149 | 182R | 211 | 243R | 265 | 284TL |
| 20 | 49 | 74 | 150 | 183 | 214 | 245 | 267TL | 284BL |
| 21 | 50 | 75 | 153 | 184 | 217 | 246 | 267BL | 284TR |
| 22-23 | 51 | 76-77 | 154 | 185 | 220 | 247 | 267R | 284BR |
| 24 | 52 | 78 | 156 | 190 | 223 | 248T | 268TL | 287R |
| 25 | 53 | 79 | 158 | 191 | 224 | 248B | 268BL | 288 |
| 26 | 54 | 80 | 160-1 | 192 | 225 | 249 | 269R | IBC |
| 27 | 55 | 81 | 163 | 193 | 226 | 250 | 270L | OBC |

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FIRST CLASS
PERMIT No. 36
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*Readers Service Dept.*

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**FOUNDRY Readers Service**

low-grade men to operate their sand systems and later failed to understand why casting loss due to sand failure was running so high. The qualifications of a sand mixer should certainly be as high as those of a molder or melter. He can make or break a foundry's efficiency, for the effect of his work is unfailingly indicated at the scrap-pile, or in the expressed opinions of the customers. It is hardly necessary to imply that this fellow should be well treated, well paid, and his enthusiasm encouraged. His curiosity should be gratified insofar as you are able to do so.

Despite some thirty-odd years of accumulated information relative to so-called scientific foundry sand practice, we are still figuratively in kindergarten. Although it is true that some splendid progress has been made, and that the boys in the laboratory have come up with many valuable suggestions which serve daily to lessen the headaches peculiar to foundry practice, we still are plagued with faulty diagnosis and quack prescriptions.

### Still Much To Learn

The Harry Dietert sand schools and efforts of a similar nature, both of an individual and collective character, have done and are doing much to simplify and otherwise improve the growing textbook of sand study. Aside from this page, the magazine you are now reading has contributed over the years an incalculable amount of practical assistance to foundrymen all over the world. Many of our great foundry suppliers distribute pamphlets or booklets on sand practice to aid the bewildered foundryman.

The American Foundrymen's Society has, of course, been a leader in the dissemination of information and ideas of interest to our industry. But in spite of the efforts of these agencies, and others not mentioned, our knowledge of foundry sand behavior still leaves much to be desired. The little fellow (operator of a small foundry), should repeatedly review his basic training, while questioning much that he has been taking for granted. The big fellow (large foundry) can afford the luxury of a profound and erudite investigation, which the little fellow may later inherit if he deserves the bequest.

Someone has said that there is no royal road to knowledge. This is especially true of foundry sand practice. If the muller man and his immediate superior will co-operate (sympathetically) on a cautious program of experimentation, weighing and recording all information relative to sand behavior, regardless of the source of such information, the rewards of such a program will not long be denied.

In going from a simple to a complex method of sand control, there is always the danger of things getting out of hand, of becoming too complex, and then we should logically start all over again, back to the basic mix. Sand control, as the experts often have told us, is simply a matter of adjusting variables, of balancing the additive materials to develop and maintain the desired properties which are required to do a given job.

Does anyone think that this is a simple matter?

To me it isn't, and I doubt that it ever will be, for I am connected with a gray iron jobbing shop which produces castings from a pound to well over 500 lb in green sand. In dry sand we now stop at 12 tons. Aside from the torture and destruction imposed by molten metal, we have pattern, molding machine, and human problems that deepen the wrinkles in the sandman's brow.

However, all of his days are not


MORE FOUNDRY PRODUCTION by

Copyright 1955

OVENgineering*

* Ovens engineered to fit production need will result in more production and more foundry profits. This belief is supported by an ever increasing number of forward looking metalworking companies and foundries as they keep cost checks on Despatch "Ovengineering".

For 52 years Despatch has been designing, building and installing foundry ovens for the nation's leading foundries. They have developed many features and designs to speed baking of cores, to improve core quality, make better use of labor, to fit ovens in difficult floor space. In fact Despatch has developed "Ovengineering" to a science that will put new profits in core making in your foundry. Let us send you a copy of our Foundry Bulletin No. 31 or have a field engineer visit. He will tell you how Despatch Ovengineering will assist you in your foundry.

WRITE DEPT. N

Minneapolis Office: 619 S. E. 8th St.
Chicago Office: 4554 N. Broadway

DESPATCH OVEN COMPANY

THIS $4.70 BLOCK CAN SHOW YOU

HOW TO END

SLAG HOLE FAILURES

Why go on tolerating the frequent production stoppages caused by early failures of slag hole blocks in continuous pour cupolas? For only $4.70 you can buy a standard-size CARBOFRAX® silicon carbide block and keep a furnace running without interruptions for 20 hours or more. Sizes available from stock molds to fit any cupola. Order one or two blocks today and compare the service they give you with what you are getting from your present blocks. Write Dept. AA45, Refractories Division, The Carborundum Company, Perth Amboy, New Jersey.

CARBORUNDUM

Registered Trade Mark

NOMAD gives you LOW COST SMOOTH-FLOWING ACTION in the foundry

Any foundryman can assemble Nomad interchangeable conveyor parts just like an erector set. Only, he's not "playing." The newly developed conveyor system will bring low cost, efficient, profit-making production. It gets your molds where you want them, smoothly and quickly, without loss of time, without shifts in the mold, without even an aching back.

Write for information so that you too can plan your own conveyor system.



THREE WEIGHTS extra heavy, standard, and light

SMOOTH MOLD TRAVEL

Pat.

NOMAD FOUNDRY EQUIPMENT

Division of WESTOVER ENGINEERS
3110 W. FOND DU LAC AVE.
MILWAUKEE 10, WIS.

cloudy. Sunshine breaks through as casting finish improves and less loss is evident, and it is then that your conscientious sand-mixer would not change places with any man in the plant, or for that matter, in the world!

## Firefighting School Announces Class Schedule for 1955

Industrial firefighting will be taught at 12 different three-day sessions sponsored by the Ansul Chemical Co. During the course of instruction on the company's ten-acre fire test field, students are taught the latest techniques of fire extinguishment with dry chemical fire equipment, as well as with other extinguishing agents. Because the test field is equipped to simulate virtually every type of fire to be found in industry, students are encouraged to bring any special fire extinguishing problems to the school so that Ansul engineers can help in finding a solution.

The courses are open to industrial plant safety personnel, firefighters and other interested personnel. Instruction and equipment are provided by Ansul. The first class starts May 23, the last starts Sept. 19. Registration is limited. For further information write Director Fire School, Ansul Chemical Co., Marinette, Wis.

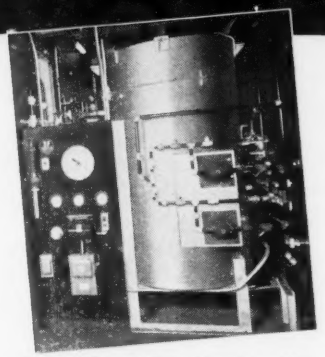
## Colloid Revises Its Book on Foundry Sand Practices

Rearrangement, new chapter headings and an expanded size are features of the fourth edition of *Foundry Sand Practice,* published by the American Colloid Co. The author, Clyde A. Sanders, has included new chapters on sand control tools, sand properties, zircon and seacoal. Illustrations have been included in the chapter on casting defects. The book, bulletin 240, is available from the American Colloid Co., 813 Merchandise Mart, Chicago 54, for $2.

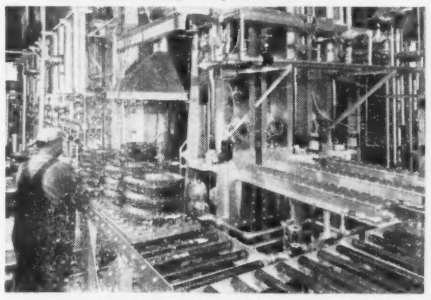
## Europeans Study Productivity

Systematic study of foundry productivity has been undertaken by a European committee organized as a result of the success of the exchange of productivity teams started by the United States a few years ago. At the time of the International Foundry Congress in Florence last September a meeting of this committee was organized by the Italian Association of Foundry Owners. Six papers on foundry productivity were presented.

EF SPECIAL ATMOSPHERE EQUIPMENT



We build endothermic and exothermic gas generators, ammonia dissociators, refrigerators, dryers, desulphurizers, gas scrubbing units and other special atmosphere equipment—and furnaces—in a wide range of sizes to meet every heat processing requirement.

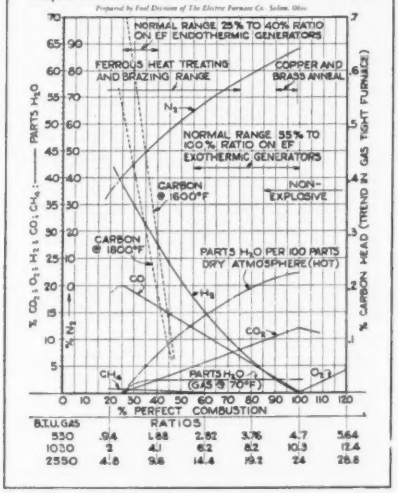


An EF gas-fired radiant tube 3-row tray pusher special atmosphere continuous carburizing furnace.

**Special Atmosphere Chart**

Compiled from Natural Gas Analyses (City Gas and Propane Gas will be similar)

*Prepared by Fuel Division of The Electric Furnace Co. Salem, Ohio*


NORMAL RANGE 25% TO 40% RATIO ON EF ENDOTHERMIC GENERATORS
FERROUS HEAT TREATING AND BRAZING RANGE
COPPER AND BRASS ANNEAL
NORMAL RANGE 55% TO 100% RATIO ON EF EXOTHERMIC GENERATORS
CARBON @ 1600°F
NON-EXPLOSIVE
CARBON @ 1800°F
PARTS H2O PER 100 PARTS DRY ATMOSPHERE (HOT)
PARTS H2O (GAS @ 70°F)
% PERFECT COMBUSTION
PARTS H2O
% CO, O2, H2, CO2, CH4
% CARBON HEAD (TREND IN GAS TIGHT FURNACE)

| B.T.U. GAS | RATIOS | | | | | |
|---|---|---|---|---|---|---|
| 530 | .94 | 1.88 | 2.82 | 3.76 | 4.7 | 5.64 |
| 1030 | 2 | 4.1 | 6.2 | 8.2 | 10.3 | 12.4 |
| 2550 | 4.8 | 9.8 | 14.4 | 19.2 | 24 | 28.8 |

Above percentages on gas atmosphere constituents have been averaged from many complete gas analyses. Actual gas analyses may vary slightly from above curves due to differences in generator temperature, catalyst, the completeness of reaction, raw gas analysis and air-fuel ratio.

Larger charts suitable for notebooks or wall hanging furnished on request.

THE ELECTRIC FURNACE CO. Salem-Ohio

## To Present Materials Handling Show in Chicago, May 16-20

Over 200 companies will use 115,000 sq ft of booth space to display and demonstrate materials handling equipment at the 1955 National Materials Handling Exposition. The show will be held May 16-20 in the new exposition hall recently completed as an addition to the International Amphitheatre in Chicago.

A Materials Handling Conference is being held concurrently with the exposition to permit visitors to supplement their inspection of machinery with discussions of case histories of materials handling installations. Fork lift trucks, conveyors, hoists, monorails, cranes, tractors, trailers, hand trucks, elevators, stacking units, railroad car loaders and other equipment will be demonstrated under simulated factory conditions.

## Aids Handicapped, Wins Award

Presentation of the 1954 Physician's Award of the President's Committee on Employment of the Physically Handicapped was made to Dr. Harold A. Vonachen, medical director of Caterpillar Tractor Co., Peoria, Ill., on Jan. 25 in Washington at a meeting of the Congress on Industrial Health. Selection of Dr. Vonachen was based on his contribution to the employment welfare and rehabilitation of handicapped people.

He has helped to develop a program at Caterpillar whereby employees suffering accidents as well as others who are handicapped work on jobs within the limits of their handicaps. Dr. Vonachen also was cited for his leadership in the development of a city-wide program for employment of the handicapped in Peoria.

## Book Review

*Report on the Elevated Temperature Properties of Selected Super-Strength Alloys,* paper, 208 pages, 8½ x 11 in., published by American Society for Testing Materials, 1916 Race St., Philadelphia 3. Price $4.75.

This third in a current series of reports prepared under the auspices of the Data and Publications Panel, ASTM-ASME Joint Committee on the Effect of Temperature on the Properties of Metals, primarily is a graphic summary of high-temperature strength data on 13 selected alloys. Included are 116 curves showing tensile strength; 0.2 per cent offset yield strength; elongation; reduction of area; stresses for rupture up to 100,000 hr and stresses for creep rates.

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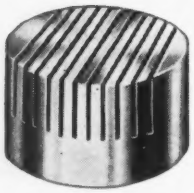
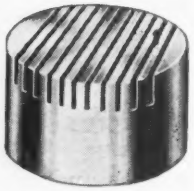
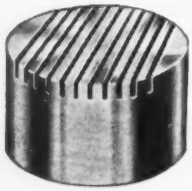


X-TRA DEEP HEAD .156 Wide Slots .014

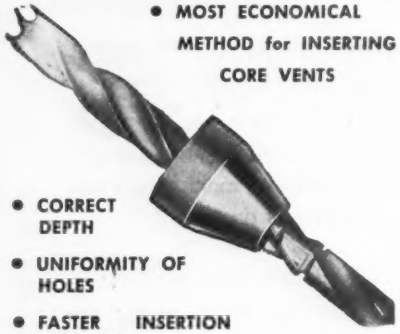


DEEP HEAD .093 Wide or Narrow Slots .014 .010



SHALLOW HEAD .031 Wire or Narrow Slots .014 .010

INSERTING DRILL



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# TRADE PUBLICATIONS

**For more details on these items use reply card—page 221**

**TEMPERATURE DETECTORS:** Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.—Data sheet N-S3 (1) covers the use of radiation-type temperature detectors available in both open and closed-end mountings. The detectors are used for either direct sighting applications to measure the temperature of surfaces or for sighting into closed-end target tubes to measure the temperature of a furnace atmosphere or other medium.

For More Details Circle No. 141—Page 221

**VACUUM PUMPS:** New York Air Brake Co., Kinney Mfg. Division, Boston 30, Mass.—Line of vacuum pumps ranging in size from a ¼-hp unit with a displacement of 2 cfm, to a 40-hp unit having a displacement of 780 cfm is described in illustrated bulletin V-54. Graphs and tables accompany description of the construction and operating characteristics of single-stage, compound and two-stage mechanical booster pumps.

For More Details Circle No. 142—Page 221

**GLAZING COMPOUND:** Lincoln Oil & Paint Co., 3921 Mayfield Rd., Cleveland 21, O. — New nondrying, permanently elastic glazing compound that absorbs vibration, shock and expansion and contraction of steel and wood sash is covered in bulletin 541. Photographs show method of application and point out some of the properties of the material.

For More Details Circle No. 143—Page 221

**INDUCTION FURNACES:** Laboratory Equipment Co., St. Joseph, Mich.—High-frequency laboratory induction furnaces that reach temperatures over 3000° F are described in a bulletin punched for three-ring notebooks. Wiring diagrams and illustrations of the furnaces aid in the explanation.

For More details Circle No. 144—Page 221

**SAND MULLER:** Beardsley & Piper Division, Pettibone Mulliken Corp., 2424 North Cicero Ave., Chicago 39, Ill.—Power consumption of a sand muller during a complete mixing cycle is shown by an actual power graph.

For More Details Circle No. 145—Page 221

**ALUMINUM BONDING:** Precision Electronic Research Co., Glendora, Calif.—Aluminum bonding metal used in the bonding of castings to castings, castings to extrusions and castings to sheet without the use of flux is described in an illustrated folder.

For More Details Circle No. 146—Page 221

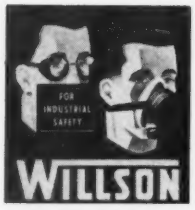
**FANS AND VENTILATORS:** Francis Hill Co., 20350 Center Ridge Rd., Cleveland 16, O.—Propeller fans and power roof ventilators featuring cast fan blades and rugged design for heavy industrial applications are depicted in a four-page bulletin. A table gives important dimensions of the equipment which is furnished in polyethylene plastic for corrosive applications.

For More Details Circle No. 147—Page 221

**ELECTRIC TRUCKS:** Raymond Corp., 65-129 Madison St., Greene, N. Y.—Attachments for use with an electric tractor unit are illustrated in bulletin 845. Features of each attachment are described.

For More Details Circle No. 148—Page 221

**SAFETY EQUIPMENT:** Willson Products Inc., Reading, Pa.—New general catalog on industrial safety equipment has been published for use as a reference book by those interested in industrial safety. The catalog is divided into four major sections — eye protection, head protection, respiratory protection and welding. Illustrations, descriptions and ordering information have been correlated for simplicity and practicability. The catalog has been designed as a workable, everyday safety manual.




For More Details Circle No. 149—Page 221

**STEEL SHOT:** American Wheelabrator & Equipment Corp., 505 South Byrkit St., Mishawaka, Ind.—Bulletin 89B describes high-carbon, heat treated steel shot designed exclusively for shot blasting operations.

For More Details Circle No. 150—Page 221

**RELIEF VALVES:** Hening & Co., Lewis Tower Bldg., Philadelphia, Pa.—Catalog 5200 describes and illustrates a relief valve designed for steam, air or gas service. Service records established by these valves are reported.

For More Details Circle No. 151—Page 221

**JIB CRANES:** Abell-Howe Co., 53 West Jackson Blvd., Chicago 4, Ill.—Eight jib cranes for various types of mounting and headroom conditions are pictured in a new illustrated catalog. A load transfer mechanism, manual and electric hoists, and electrification materials also are shown.

For More Details Circle No. 152—Page 221

**SCALE CONTROL:** Aqua Electric Scale Control Inc., 2028 East 22nd St., Cleveland 15, O.—Electric unit for controlling scale in air conditioners, boilers, compressors, cooling sys-

# 360° hoist hook service...

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Here's the answer to economical local handling service to process machines, particularly beneath heavy mill type cranes... it's the American MonoRail Pedestal Jib. These jibs are recommended for capacities between 500 to 4,000 pounds, headroom 9 and 12 feet, and boom length 8 and 12 feet... a truly precision built, skillfully engineered job. Turn to American MonoRail for any overhead handling requirements. Your American MonoRail engineers will be glad to consult with you.

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tems, pumps, sprays, tanks, vats and other equipment using water is explained in folder. Points of installation are pictured and dimensions and capacities for various pipe sizes are included.

For More Details Circle No. 153—Page 221

**SOLENOID VALVES:** Automatic Switch Co., 391 Lakeside Ave., Orange, N. J.—New two-way solenoid valves for use in controlling the flow of air, gas, water, light oil and other noncorrosive fluids are described in form 708. Operation, description and flow charts of the valves are included. Another publication, 553, tells how to select a magnetically or mechanically held relay. This bulletin includes tables and current diagrams.

For More Details Circle No. 154—Page 221

**LUBRICATION SYSTEM:** Farval Corp., Affiliate of Cleveland Worm & Gear Co., 3261 East 80th St., Cleveland 4, O.—Advantages of centralized lubrication for small machines and equipment with a limited number of bearings are depicted in bulletin 16. Lubrication system provides for lubrication of 12 bearings from a single grease gun connection.

For More Details Circle No. 155—Page 221

**HEAT TREATING:** Surface Combustion Corp., Toledo 1, O.—*Heat Treat Review* contains articles of interest to foundrymen. Volume 5, No. 2 contains an article on the mass production of pearlitic malleable iron and Volume 5, No. 1 tells about heating molds in the investment casting process.

For More Details Circle No. 156—Page 221

**STEEL BUILDINGS:** Sales Control, Brookville Mfg. Co., Brookville, Pa.—Design features of all-steel buildings are explained in bulletin 102. Description is worked around a cut-away view of a typical fully insulated all-steel building. General specifications are included.

For More Details Circle No. 157—Page 221

**HAND TRUCKS:** Magnesium Co. of America, Materials Handling Division, East Chicago 19, Ind.—Brochure illustrates design and construction features of magnesium all-bolted hand trucks. Choice of models and accessories is stressed.

For More Details Circle No. 158—Page 221

**SPUR-GEAR HOISTS:** Coffing Hoist Co., Danville, Ill. — Pictures, cut-away drawings, descriptions and specifications of spur-gear hoists with capacities from 1/4 to 25 tons are given in bulletin YC-YCT.

For More Details Circle No. 159—Page 221

**FIRE EXTINGUISHER:** Stop-Fire Inc., 125 Ashland Place, Brooklyn 1, N. Y.—Bulletin RJ-255 covers a new type of water or antifreeze fire extinguisher which is a one-hand operated stored-pressure unit.

For More Details Circle No. 160—Page 221

**POWER TRANSMISSION:** American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa.—Four new illustrated catalogs, containing selec-

## Foundry reports 25% reduction in casting cleaning time with ARCAIR TORCH

CLARK Equipment Company of Buchanan, Michigan, manufacturers of material handling equipment, have set up a new stage in their production line operation to speed the cleaning of rough castings after they leave the foundry, before machining.

Axle housings are sent to the cleaning department where defects and excess metal are removed, using an Arcair gouging and cutting torch. Cleaning time has been cut 25% over older methods, Clark reports, with most of the former grinding and finishing operations eliminated! The use of the Arcair torch also results in a neater finished job.

Older methods of cleaning castings using ordinary cutting torches or carbon arc without air, have been discontinued in favor of the time-saving Arcair method. The operation of the Arcair torch is based upon the melting action of an electric arc, combined with a jet of compressed air constantly directed at the point of arc. Slag and molten metal are blown away before they can harden, leaving a clean, even groove or cut. The operator has complete control over the gouging action to such an extent that little or no grinding is required to finish up the cleaning or cutting job.

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*Cuts all metals—using only electric arc and compressed air*

tion and dimensional information as well as engineering data, depict a line of power transmission equipment. Catalog WBC-55-2 covers V-belts; CPC-55-2 describes conveyor pulleys; speed-reduction drives are summarized in SRC-55-2, and specifications for equipment used in flat-belt drives are included in FBC-55-2.

For More Details Circle No. 161—Page 221

**CONTROLLERS:** Minneapolis-Honeywell Regulator Co., Industrial Division, Wayne and Windrim Ave., Philadelphia 44, Pa.—Millivoltmeter controller housed in a 19-in.-wide horizontal case suitable for mounting in standard relay racks is described in bulletin 1060. Complete specifications, list of control forms, drilling dimensions and ordering information are given.

For More Details Circle No. 162—Page 221

**FORK LIFT TRUCKS:** Towmotor Corp., 1226 East 152nd St., Cleveland 10, O.—Jan. 1955 issue of *Handling Materials Illustrated* gives information on materials handling operations. Documentary photo-stories outline handling problems and their solution. A special section is devoted to excerpts from a new job study and a photographic report on materials handling progress in industry all over the world. Announcement is made of a new line of fork lift trucks in the 5000-lb capacity class having the compactness and maneuverability of smaller capacity trucks.

For More Details Circle No. 163—Page 221

**GAS REGULATOR:** North American Mfg. Co., 4455 East 71st St., Cleveland 5, O.—Variable ratio gas regulators for use with burners that operate well on lean air-gas ratios at low firing rates are described by sheet R-16. Dimensioned drawings, a table of capacities and a price list complete the sheet.

For More Details Circle No. 164—Page 221

**PALLET TRUCK:** Barrett-Cravens Co., 628 Dundee Rd., Northbrook, Ill.—Bulletin 551 describes a low-lift electric pallet truck built with capacities of 4000 and 6000 lb. Specifications, features and ramp performance values are covered.

For More Details Circle No. 165—Page 221

**RING GASKETS:** Garlock Packing Co., Palmyra, N. Y.—Catalog AD-148 describes ring gaskets and packing for both dynamic and static applications. Complete design information and recommended pressures are given.

For More Details Circle No. 166—Page 221

**HEIGHT GAGE:** George Scherr Co., 200 Lafayette St., New York 12, N. Y.—Stabilized height gage provided with both inch and millimeter

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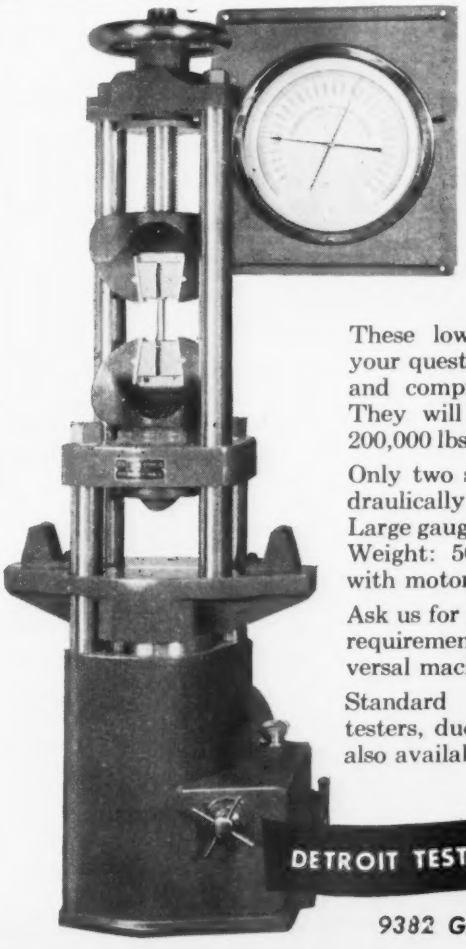

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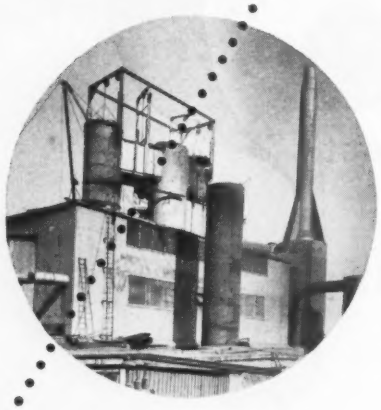

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scales is illustrated in a new folder. Reading of the vernier scale, almost 2½ in. long, is pictured. Features and advantages of the gage are pointed out.

For More Details Circle No. 167—Page 221

**TOOL ATTACHMENT:** Little Beaver Industries, 38809 Mentor Ave., Willoughby, O.—Compact tool attachment for portable electric drills which will saw wood, plastic or plasterboard and cut all metals in pipe, bar, tube, rod or sheet form without a starting hole is described in an illustrated folder.

For More Details Circle No. 168—Page 221

**MOBILE CRANE:** Silent Hoist & Crane Co., 885 63rd St., Brooklyn 20, N. Y.—Bulletin 89 describes swing-boom mobile cranes with front wheel drive and rear-wheel steer available in capacities ranging from 1½ to 10 tons. Illustrations and case histories are included.

For More Details Circle No. 169—Page 221

**TEMPERATURE CONTROL:** United Electric Controls Co., 85 School St., Watertown 72, Mass.—New indicating temperature control giving control point accuracy equivalent to individually calibrated units is described in bulletin 42.

For More Details Circle No. 170—Page 221

**SOLENOID VALVES:** J. D. Gould Co., 730 East Washington St., Indianapolis 2, Ind.—Direct-lift solenoid valves made in brass and stainless steel are illustrated in bulletin F-1. Available sizes and maximum allowable pressures are given.

For More Details Circle No. 171—Page 221

**OVEN CONTROL:** Claud S. Gordon Co., 3000 South Wallace St., Chicago 16, Ill.—Industrial batch ovens equipped with a power control said to proportion minimum wattage automatically to operating temperature and work load are pictured in bulletin 5510.

For More Details Circle No. 172—Page 221

**COOLING TOWERS:** Halstead & Mitchell, Bessemer Bldg., Pittsburgh, Pa.—Cooling towers used with air compressors are described in a new 16-page catalog. Operating characteristics, specifications, tables, drawings and graphs are presented in the booklet.

For More Details Circle No. 173—Page 221

**PROPORTIONAL MIXER:** Eclipse Fuel Engineering Co., Rockford, Ill.—Bulletin L-700 gives details of a proportional mixer with an adjustable jet for gas-fired heating equipment. Selection chart and capacity tables are included.

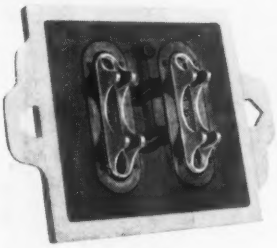
For More Details Circle No. 174—Page 221

**CRANE-EXCAVATOR:** American Steel Dredge Co., Wayne Shovel & Crane Division, Ft. Wayne, Ind.—Complete descriptions and specifications of ¾-yard crane-excavators are given in two bulletins. Crawler-

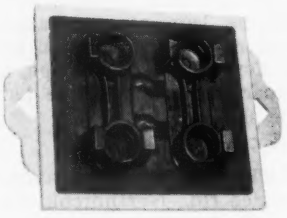

# PRODUCTION UP 600%

**No wonder they call it . . .**

# SUPER TAMASTONE



● Cope side shows 3" high white metal section set in SUPER TAMASTONE. Due to thin projections 2 ram-up cores must be used.



● Drag side is entirely of SUPER TAMASTONE with 3½" draw cup pattern.

**PRODUCTION STEPPED-UP 600% HERE!**

With original loose pattern equipment only 35 molds—castings per day were possible. With SUPER TAMASTONE plates shown here 110 molds—220 castings were delivered. All the foundry did was make a duplicate SUPER TAMASTONE pattern. Original and duplicate were then gated together in a 14x16 flask to make match plate. Check photos—see how simple it was.

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**TAMMS INDUSTRIES, INC.** 228 N. La Salle St., Chicago 1, Ill.

mounted machines are covered in bulletin 424; truck-mounted machines are described in bulletin 425.

**For More Details Circle No. 175—Page 221**

**UTILITY FANS:** Trane Co., La Crosse, Wis. — Advantages of new belt-driven and direct-drive centrifugal fans, their construction and special features for specific types of applications are covered in bulletin DS-348U.

**For More Details Circle No. 176—Page 221**

**INDUSTRIAL OVENS:** Jensen Specialties Inc., Advance Heating Division, 9331 Freeland Ave., Detroit 28, Mich.—Complete information on the selection of heater panel ovens for industrial applications is given in a 16-page booklet.

**For More Details Circle No. 177—Page 221**

**PARTS WASHER:** Storm-Vulcan Inc., 2225 Burbank St., Dallas 19, Tex.—New publication describes a parts cleaning machine designed for automotive and industrial application. Capacity, specifications and construction features of the unit are covered.

**For More Details Circle No. 178—Page 221**

## *FOUNDRY* reprints

**Special Report on Foundry Industry Progress** presents a discussion by industry leaders on subjects relating to the growth and future potential of the industry. Articles on the technical and operating advances made in gray iron, aluminum, steel, brass and bronze, malleable iron and magnesium are covered.

**For a Copy Circle No. 179—Page 221**

**Production of Aluminum-Nickel Bronze Sand Castings** by Vincent DePierre and Richard C. Wynne covers melting equipment, raw materials, melting procedures, temperature control, pouring practices, mold materials, heads, risers and gating and other technical considerations.

**For a Copy Circle No. 180—Page 221**

**New Precision Investment Foundry Incorporates Specialized Equipment** by Ted Operhall provides a comprehensive description of the facilities, production methods and equipment in use at Whitehall Precision Casting Division, Michigan Steel Casting Co.

**For a Copy Circle No. 181—Page 221**

**Efficient Operation Doubles Foundry Production** by Robert H. Herrmann offers a detailed report on the production techniques of the Massey-Harris Co. Ltd., Foundry, Brantford, Ont. This efficient operation melts 240 tons of gray iron daily for farm implement castings with a yield of 68 per cent.

**For a Copy Circle No. 182—Page 221**


# LOOKING FOR FOUNDRY SAFETY APPAREL?

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Amazing new compound makes asbestos, duck and burlap garments extremely resistant to heat, molten metal splash, acids, caustics, oil and water. Long wearing and low cost. Users won't buy anything else. Nothing to compare with it. Available in coats, pants, aprons, sleeves, leggings, spats, hoods, etc.

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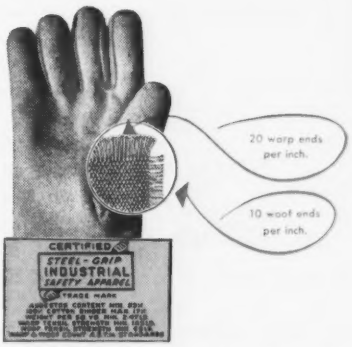


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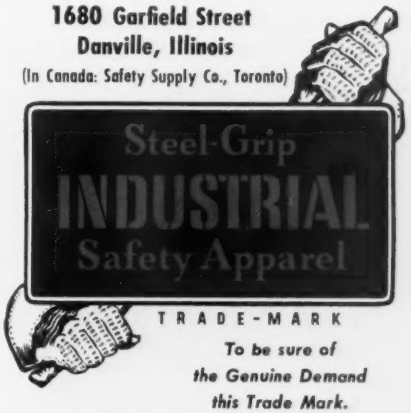


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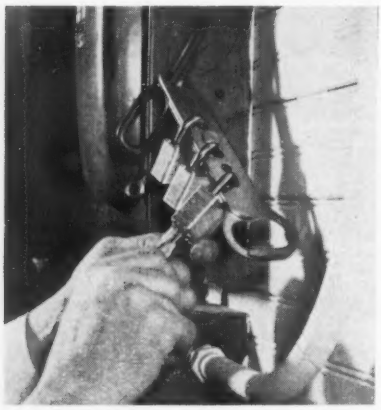
# THE SHAKEOUT

## Locking Out Industrial Accidents

AS A MEANS of reducing industrial accidents, Master Lock Co., Milwaukee, urges maintenance men to padlock control switchboxes when they are repairing industrial machinery or other equipment. The company recommends that each man carry a padlock which only he can open. The device shown here permits up to six men to "lock out" the same switchbox, making it impossible for power to be turned on until all of them have finished. This practice is endorsed by the National Safety Council.

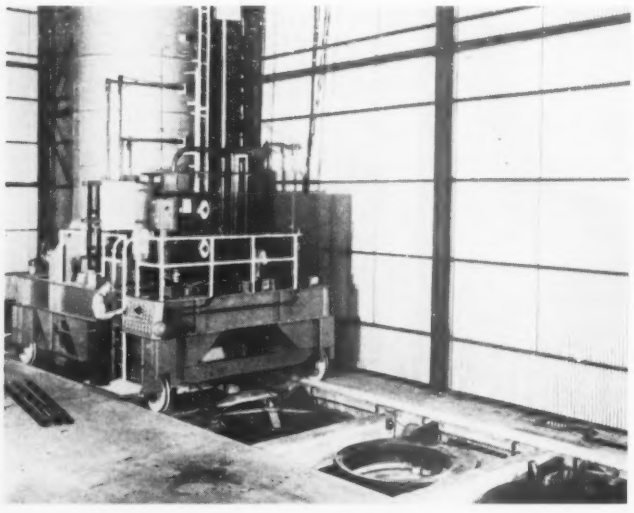


For More Details Circle No. 203—Page 221

## Giant Furnace Goes into Operation

THE LARGEST drop-bottom metal treating furnace of its type in the world began operation early this year at Metallurgical Inc., Minneapolis. Specially designed to heat treat extra-long parts vertically, the furnace hardens, anneals, stress relieves and normalizes steel and aluminum. Controlled endothermic or neutralene atmosphere insures bright work and eliminates scaling. Three chart-type recording instruments control furnace temperature at 2200° F, within ± 5°.

Distortion is kept to a minimum by vertical heating and by quenching in a 22-ft-deep, temperature-controlled,



agitated salt bath which is said to reduce distortion up to 90 per cent as compared with oil quenching.

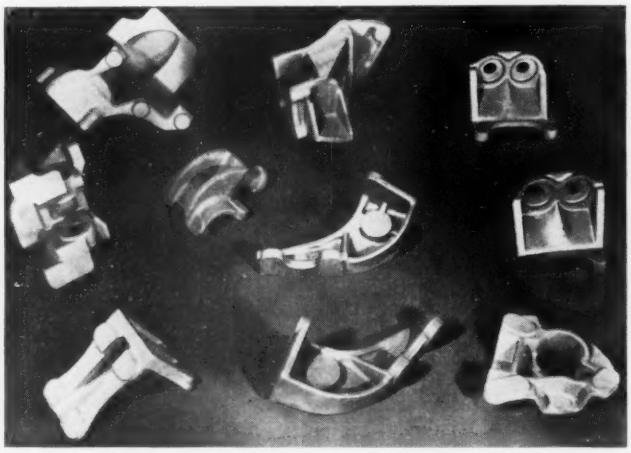
The furnace is mounted on a carriage and moves along tracks over a pit 25 ft deep and 60 ft long. The pit houses three agitator-type tanks for quenching in water, martempering oil or hot salt. Capacity of the water and the oil tanks is 6300 gals each. The hot salt tank is charged with 105,000 lb of molten salt. Parts to be hardened are suspended from a fixture in the loading end of the pit and brought up to the specified temperature for the required time. The operator then moves the furnace over the desired quench and lowers the load into it with a speed of from 1 to 10 ft per second.

The furnace was designed by Loftus Engineering Corp.

For More Details Circle No. 204—Page 221

## Aluminum Castings Cut Tractor Weight

ALUMINUM sand castings have cut nearly 1000 lb from the weight of Mack Truck's tractors, with no sacrifice in strength. Cast by Oberdorfer Foundries Inc., Syracuse, N. Y., the aluminum parts include brackets for steering gear, engine, springs, air chamber, breaker spider and



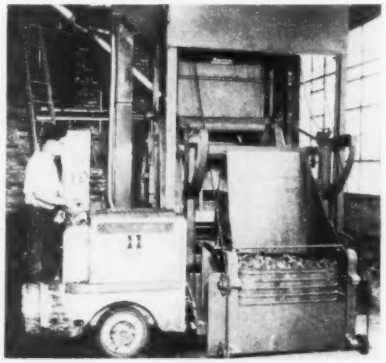
numerous other mounting and supporting sections.

Because of increasingly strict limits on the gross weight of trucks and the fact that every pound saved in a vehicle can be added to the payload, Oberdorfer has been producing lightweight castings for a growing number of manufacturers in the automotive, truck and diesel fields.

For More Details Circle No. 205—Page 221

## Mechanized Loading Cuts Costs

MECHANIZED LOADING and unloading of a skip hoist which feeds its cleaning equipment has eliminated physical effort and greatly decreased man-hours required for the operation at Rockford Drop Forge Co., Rockford, Ill. Formerly, two men took 15 minutes to transfer the load from a portable skid box to the skip hoist bucket on the cleaning machine. A platform truck was used to deliver the full skid bin to the charger for cleaning.



Local sales engineers of Elwell-Parker Co., Cleveland, designed and supervised the building of a new type of skip hoist charger that receives standard skid boxes through a side entry. With this arrangement, the load can be discharged directly from the containers into the cleaning machines. A standard Elwell-Parker low-lift platform truck was assigned to this work.

During the 10-12 minutes required for the cleaning cycle, the truck delivers the previous charge of cleaned

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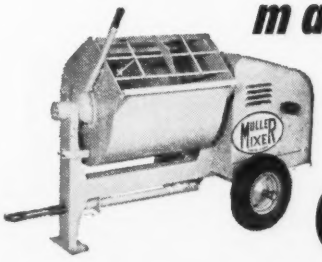


You can save time and money and make better cores with the Muller New 3½ Cubic Foot Core Sand Mixer. It mixes 250-300 pounds per batch. Better cores mean better castings. This new, labor-saving Core Sand Mixer will "buy itself" out of savings in a short time.

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This Mixer is also available in 2, 6, 6 to 8, and 9 Cubic Foot sizes.

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# Cut Blast Cleaning Costs

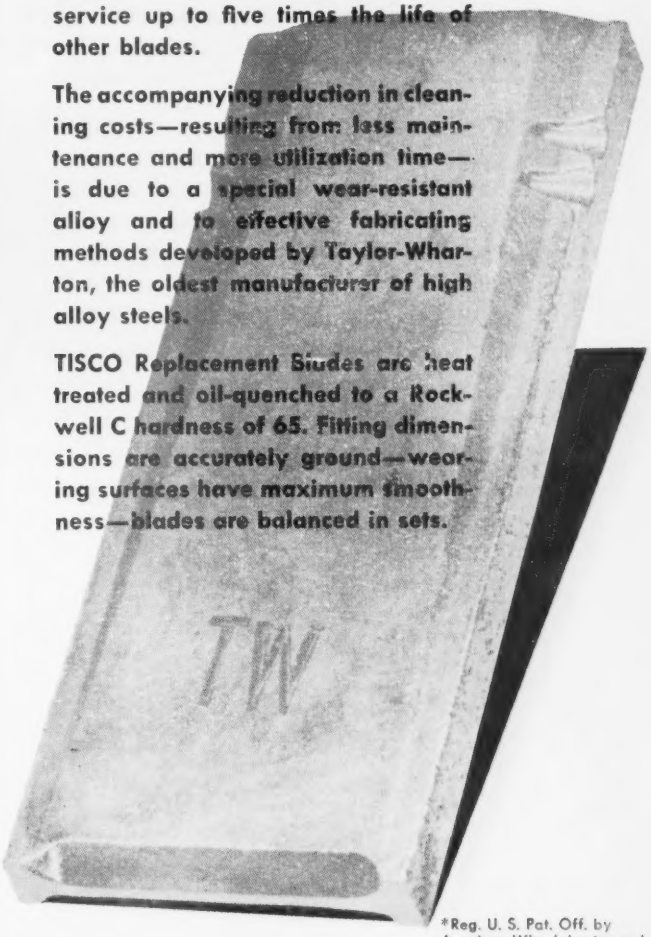
## *With Long-Lived*

# TISCO® REPLACEMENT BLADES

**TISCO Replacement Blades to fit Wheelabrators* have given extra dividend service up to five times the life of other blades.**

**The accompanying reduction in cleaning costs—resulting from less maintenance and more utilization time—is due to a special wear-resistant alloy and to effective fabricating methods developed by Taylor-Wharton, the oldest manufacturer of high alloy steels.**

**TISCO Replacement Blades are heat treated and oil-quenched to a Rockwell C hardness of 65. Fitting dimensions are accurately ground—wearing surfaces have maximum smoothness—blades are balanced in sets.**

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**TISCO Blades are carried by foundry dealers throughout the United States and Canada.**

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**IRON AND STEEL CO.**
(Div. of Harrisburg Steel Corporation)
**HIGH BRIDGE 7, NEW JERSEY**

Cincinnati, O. Birmingham, Ala. Easton, Pa.

parts to the next operation, picks up another skid box of uncleaned parts and delivers it to the cleaning machine in time to start the repeat cycle.

For More Details Circle No. 206—Page 221

## Laboratory Tests New Oven Performance

PERFORMANCE TESTING of ovens before their purchase has been made possible by a new research and testing laboratory recently placed in operation at Despatch Oven Co., Minneapolis.

The company reports that its various oven designs, present and projected, will be performance tested in the new lab. The firm also will use the lab to test product and oven applications before a customer decides to buy, assuring that the product involved can be heat processed to obtain the desired results and that the oven will do the job properly.

For More Details Circle No. 207—Page 221

## Anneal and Pickle Parts in Same Tray

STEEL CARTRIDGE and shell cases are both annealed and pickled at Clayton & Lambert Mfg. Co., Louisville, in trays made entirely of Inconel alloy. Manufactured by Wiretex Mfg. Co., Fairfield, Conn., the trays are 7 in. deep, 21 in. wide and 42 in. long.

Shell cases are draw annealed at temperatures from

1100 to 1200° F, in either batch or continuous furnaces. The cases are annealed, quenched, pickled and washed in the same tray, without any damage. Trays are carried through the furnace and to quench, pickling and wash tanks by a conveyor system. When trays are not in use, they can be stacked readily and stored.

For More Details Circle No. 208—Page 221

## Fork Lift Trucks Move 180,000 Parts

MOVING 180,000 parts which weigh from ¾ oz to 450 lb each is a tough job at Karl Lieberknecht Inc., Laureldale, Pa. The company uses them in the 16-ton hosiery knitting machines it manufactures. Small parts in steel drums or containers and heavy steel rails and bars have to be unloaded, temporarily stored, then moved again.

Hand trucking formerly was used, but was slow and dangerous, particularly in wet or icy weather. Employees

frequently were injured or parts broken, but employee injuries have been reduced 90 per cent and parts breakage about 60 per cent since the firm purchased two pneumatic-tired fork lift trucks. They are equipped with fold-back forks and with a crane arm which is used with a chain and hook device capable of clamping onto and vertically lifting open drums. This device also adjusts to lift and transport two drums horizontally for loading and stacking. The trucks are products of Towmotor Corp., Cleveland.

For More Details Circle No. 209—Page 221

## Cast Modern Sculpture in Aluminum

SCULPTURING represents one of the oldest applications of the casting of metals, one which multiplying industrial uses of the process have failed to eliminate. Only last month, modern art in the form of sculptured imaginary birds, cast in aluminum, came to Pittsburgh's Alcoa Building.

The sculpture is of three large aluminum birds suspended from the ceiling in the four-story arbor entrance to the building. Entitled "Birds in Flight," it weighs about 700 lb. The birds are arranged in tiers and, overall, measure about 14 ft long, 12 ft from wingtip to wingtip and about 5 ft high. It was done by Mary Callery, renowned modern sculptress.

For More Details Circle No. 210—Page 221

*Attention*

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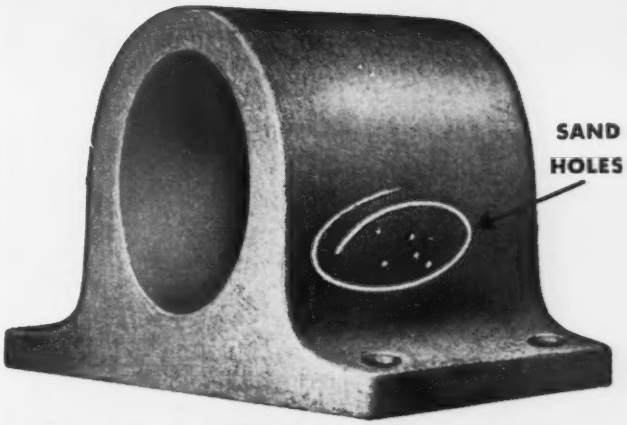


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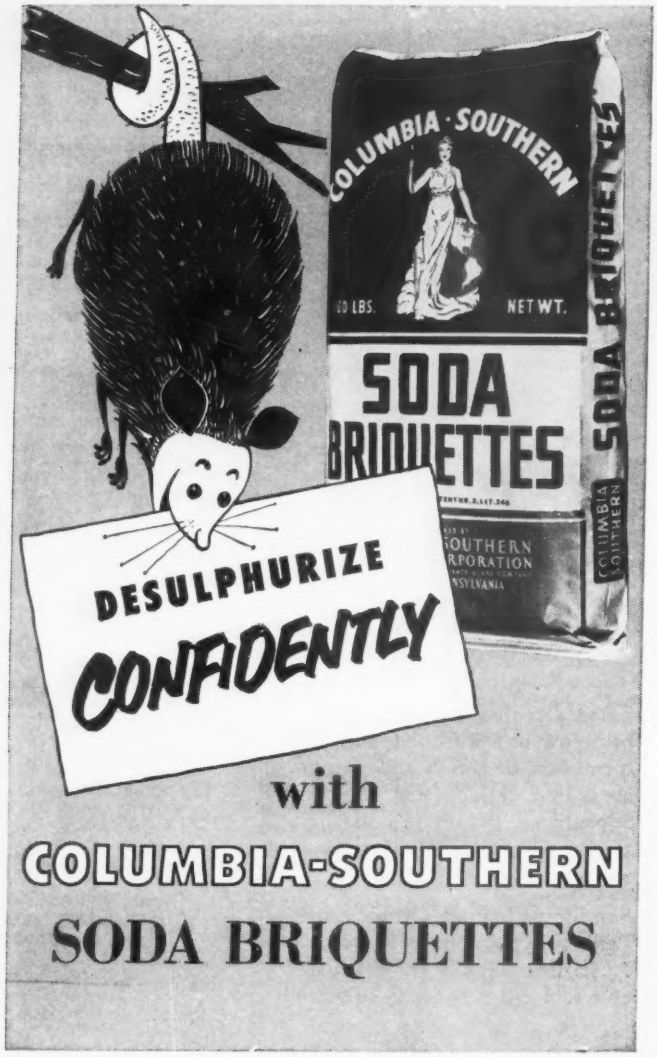


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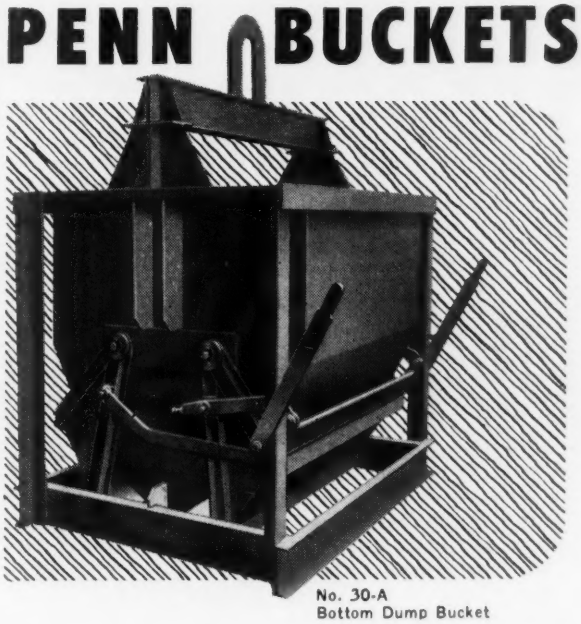

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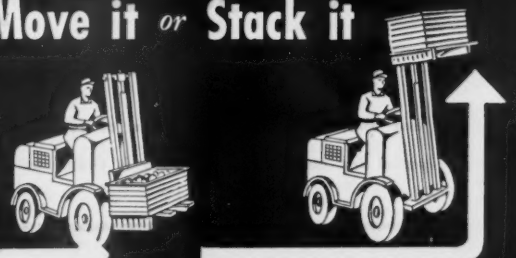

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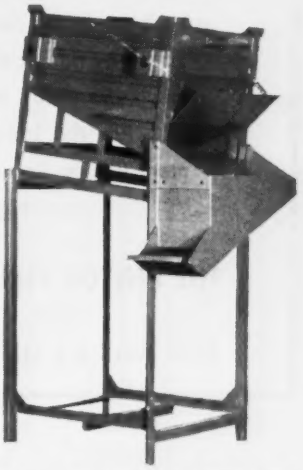

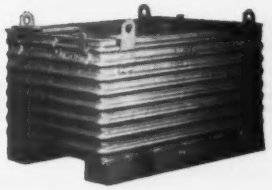

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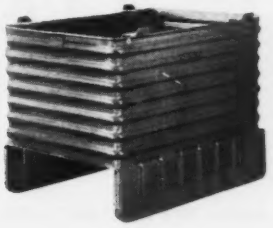

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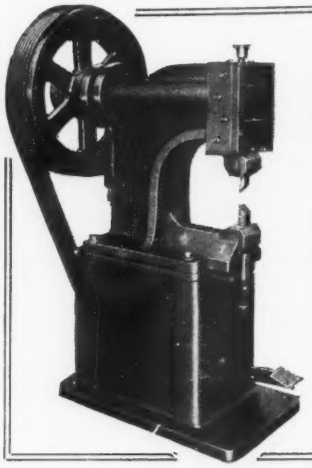

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**MOLDING FOREMAN**
**FOR SMALL AND MEDIUM SIZE STEEL CASTINGS**

Midwest foundry producing carbon and low alloy steel castings has an opening for a high caliber molding supervisor to supervise the producing of small and medium machine molded castings. The applicant must be thorough in the supervision of producing extremely high quality molds. Salary Open.

**BOX 497, FOUNDRY**
**PENTON BLDG. CLEVELAND 13, OHIO**

## Help Wanted

**JUNIOR SALES EXECUTIVE**

Big opportunity for young aggressive foundry man with some technical background. We want a man who has the ability to assume, within a few years, the sales management of a large gray iron jobbing foundry in Western New England. An established firm with excellent customer relations.

**BOX 519, FOUNDRY**
**PENTON BLDG., CLEVELAND 13, OHIO**

**PERMANENT MOLD DESIGNER**

Must be experienced. State qualifications and salary expected.

**BOX 464, FOUNDRY**
**PENTON BLDG. CLEVELAND 13, OHIO**

**STEEL FOUNDRY METALLURGIST**

Should have experience in small castings or small ingot production for new type melting operation in high frequency induction furnaces melting high alloys and nonferrous billets. Location: Midwest. Address: Box 502, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

## Help Wanted

**FOUNDRY SUPERINTENDENT**

Malleable iron foundry producing medium to small castings seeks man experienced in all phases melting, molding, gating, sand control and general foundry supervision. Exceptional opportunity for right man. Detailed reply in first letter giving full qualifications including complete work history, references, salary and when available. Replies held in strictest confidence.

**BOX 471, FOUNDRY**
**PENTON BLDG. CLEVELAND 13, OHIO**

**FOUNDRY METALLURGIST**

Midwest foundry producing carbon and low alloy steel castings has opening for plant metallurgist. Salary open.

**BOX 498, FOUNDRY**
**PENTON BLDG. CLEVELAND 13, OHIO**

**FIRST RATE FOREMAN**

Required for fully mechanized foundry in New Brunswick. Must have proven production record, knowledge of ferrous and nonferrous metals, core making and cleaning. Ability to handle men and reduce costs. Excellent opportunity for right man. Full benefits and pension. Write full particulars in strict confidence. Address: Box 455, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**WANTED**

Superintendent-Engineer for nonferrous shell mold foundry (little gray iron). Experienced in all phases. Address: Box 526, FOUNDRY, Penton Building, Cleveland 13, Ohio.

# CLASSIFIED ADVERTISING

## Help Wanted

**SAND CONTROL MAN**

Foundry producing large steel castings, also green sand castings. Apply in writing, stating qualifications and salary expected.

**BOX 506, FOUNDRY**
**PENTON BLDG. CLEVELAND 13, OHIO.**

**FOUNDRY ESTIMATING ENGINEER**

STEEL FOUNDRY REQUIRES ENGINEER TO PREPARE COST ESTIMATES ON INQUIRIES, ESTIMATE WEIGHTS, WORK AS LIAISON BETWEEN SALES AND PATTERN, MOLDING AND FINISHING DEPARTMENTS. SHOULD HAVE KNOWLEDGE OR EXPERIENCE IN TIME STUDY STANDARDS, MOLDING AND CLEANING ROOM PRACTICES IN STEEL FOUNDRY. INDICATE SALARY REQUIRED AND SUBMIT COMPLETE RESUME ON EXPERIENCE, EDUCATION AND PERSONAL STATISTICS.

**BOX 500, FOUNDRY**
**PENTON BLDG. CLEVELAND 13, OHIO**

**MOLDING FOREMAN**

Gray iron production squeezer shop on miscellaneous small and medium work. Must have complete knowledge of molding procedures and be able to direct molders expertly to quality and speed production. New York City area. Give complete past experience in detail in first letter and salary desired. Address: Box 495, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**PROJECT ENGINEER**

Specialized gray iron foundry Mid-Ohio City of about 80,000 population. Various non-repetitive production problems including research and development under supervision of Vice-President. Recent graduate foundry option Industrial Engineer with some shop experience. Replies confidential. Write full details personal background, resume of experience, references and salary expected. Address: Box 499, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**FOUNDRY SUPERINTENDENT**

Experienced in all foundry operations for production of plumbers brass goods, machine core making and machine molding; must be qualified to assume full responsibility all foundry departments. Salary commensurate with experience and ability. Permanent position, good future, excellent incentives, fringe benefits and pension.

**DICK BROTHERS, INC.**
**3rd & BUTTONWOOD STS.**
**READING, PA.**

**SUPERVISORY POSITION**

Midwestern jobbing foundry producing gray iron castings all sizes, including pit molding, needs well experienced man in green and dry sand to be trained for supervisory position. Excellent opportunity for right man in a well established business which has operated at capacity for over 25 years. Manufacturing facilities again to be expanded. State entire foundry experience. Address: Box 521, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**CLEANING ROOM FOREMAN**

A reputable Midwest foundry producing high alloy castings has immediate need for a high caliber supervisor. Extensive experience in all phases of cleaning room operations of high alloy is a prime requisite. Must be meticulous in the supervision of producing extremely high quality castings. Address: Box 505, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**MECHANICAL DRAFTSMAN**

Capable of establishing complete drafting department, including filing system by nationally known Kansas machinery manufacturers, expanding steadily. Give details and experience. All replies confidential. Address: Box 491, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**SAND SALES ENGINEER**

**To service foundry sand customers. Foundry experience necessary, sales experience helpful. Part time on new product development. Michigan. State age, education, experience, salary desired. Address: Box 460, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.**

**WANTED**

Manager with sales experience, bronze foundry. Familiar with various types of castings and metals, and general line of loose and gated work in bronze. Address: Box 479, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

## Help Wanted

**MOLDING FOREMAN**

A reputable Midwest foundry producing high alloy castings has immediate need for a high caliber supervisor. Extensive experience in the molding of high alloy is a prime requisite. Must be meticulous in the supervision of producing extremely high quality molds. Address: Box 504, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**FOUNDRY ENGINEER**

**Challenging position in management engineering for young engineer prepared to travel. Must know gray iron foundry operations, able to make layout drawings. Industrial engineering experience desirable. Reply with photo. Address: Box 458, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.**

**METALLURGIST**

Experienced in cast iron and foundry practice. Prepared to travel. State salary required and full qualifications. Address: Box 511, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

## Positions Wanted

**MANAGER OR SUPERINTENDENT**

Thirty-five years' practical experience in foundry, molder eighteen years. Have been foreman, superintendent and general manager. Did consultation work in various foundries. One was losing $7,000 per month when I started, in seven months it was making good money. Ran three largest foundries in St. Louis, largest one in Chicago. Understand gray iron, semi-steel, brass, aluminum. Know how to rig jobs to get best production at lowest cost. Understand running of cupola mix of various metals; estimating jobs from blueprints. Can give best of references. Available immediately. Address: Box 447, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**PATTERN CHECKER OR WORKING FOREMAN**

Years of experience in the medium to heavy pattern and casting industry. Steel and foundry background. Reference on request. Address: Box 468, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**PERMANENT MOLD DESIGNER**

Twenty years' experience designing, layout, detail or estimating. Can start newcomers into the permanent mold business or with old established company. Address: Box 503, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**WEIGHT ESTIMATING**

Estimating of casting weights furnished by return mail. Accurate, reliable and confidential service. Automatic calculator equipment. Nominal fee. Send blueprints to: CHARLES E. ROLAND, ITASCA, ILLINOIS.

**MANAGER OR SUPERINTENDENT**

Twenty-two years' experience, captive and jobbing gray iron foundry. Experienced in all phases of foundry operation and management including cost, quality control and timestudy. Foundry Superintendent for nine years. Age 44, married and college graduate. Address: Box 514, FOUNDRY, Penton Bldg., Cleveland 13, Ohio

**FOUNDRY ENGINEER**

Experienced in all phases modernization, mechanization, automation, layout, design, specifications, purchasing, construction, erection, maintenance, of ferrous and nonferrous foundries and allied departments. Desire position in the Chicago area. Would be valuable assistant superintendent or assistant to executive. Qualified to handle complete projects. Address: Box 512, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**FOUNDRY ENGINEER**

B.S. in Metallurgy. Twenty years' gray iron experience U. S. and Europe, five in consulting capacity to management. Experienced in surveys, plant layout and the preparation of reports. Will consider extensive travel or relocate. Address: Box 520, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**EXECUTIVE AVAILABLE**

President, Vice-President or General Manager, heavy machinery industry. Forty years old, college education. Particularly qualified in manufacturing, sales, finance. Capable foundryman. Excellent coordinator. Presently employed in this capacity. Looking for a greater opportunity. Address: Box 496, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

## Positions Wanted

**SUPERINTENDENT OR METALLURGIST**

Graduate engineer experienced all phases iron and steel foundry operations producing alloy and pressure type castings, 1 to 10,000 pounds. Presently employed in supervisory capacity. Address: Box 524, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**MANAGER-SUPERINTENDENT**

NONFERROUS—38 years of age with 19 years of extensive foundry experience. Qualified to handle all phases of foundry operation. Detailed resume on request. Address: Box 523, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**REPRESENTATIVE**

Detroit established steel casting representative wishes to represent an iron foundry. Prefer one located in Michigan. Address: Box 484, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

## Representatives Wanted

**WANTED**

A midwest custom machine tool manufacturer is expanding sales efforts into all industrial centers of U. S. and Canada. Michigan, Wisconsin and Chicago territories are now covered. Machine tool dealer or representative should know founding, process, and manufacturing engineering. All confidences respected. Full information, please.

**BOX 465, FOUNDRY**
**PENTON BLDG. CLEVELAND 13, OHIO**

**WANTED**

Agents now calling on foundries to sell patented lighting fixture designed for foundries. Exclusive. Attractive commission arrangement. No inventory. Excellent repeat business.

**MIDWEST LIGHTING PRODUCTS CO.**
**P. O. BOX 536**
**CLEVELAND 7, OHIO**

**INDUSTRIAL SALESMAN OR SALES TRAINEE**

Age 25 to 35, for established supplier furnishing basic raw material to the iron and steel industry. Metallurgical education or knowledge of iron and steel melting essential. Territory—Eastern Pennsylvania, New Jersey and Eastern New York. Prefer applicant now living in this area. Salary commensurate with experience plus expenses. Advise previous experience, qualifications and salary expected. Address: Box 508, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**SALES REPRESENTATIVE**

Large malleable foundry seeks resident to cover New England territory. Salary plus expenses. Send resume including salary desired.

**BOX 516, FOUNDRY**
**PENTON BLDG. CLEVELAND 13, OHIO**

**WANTED**

Manufacturers' Agent for aluminum production foundry located in Northern Ohio. Liberal commission. Address: Box 522, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**SALESMAN**

To sell steel castings including stainless for New York and Philadelphia areas. State qualifications. Address: Box 527, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

# Representatives Wanted

**FOUNDRY SALES ENGINEER**

WELL-KNOWN STEEL FOUNDRY NEEDS SALES REPRESENTATIVE TO COVER OHIO, EASTERN MICHIGAN, WESTERN PENNSYLVANIA. KNOWLEDGE OF FOUNDRY PRACTICE DESIRABLE. PREVIOUS CONTACTS IN HEAVY INDUSTRY USING STEEL CASTINGS HELPFUL. AGE 35-40. DEGREE IN METALLURGICAL OR MECHANICAL USEFUL. SALARY AND EXPENSES. SUBMIT COMPLETE RESUME INCLUDING EXPERIENCE, EDUCATION AND PERSONAL STATISTICS. ALSO SUBMIT RECENT PHOTOGRAPH AND SALARY DESIRED.

**BOX 494, FOUNDRY**
**PENTON BLDG. CLEVELAND 13, OHIO**

**WANTED**

Eastern manufacturer of line of vitrified and resinoid grinding wheels with patented new safety wheel for portable grinding, desires additional established representatives or distributors. Please include lines handled, area covered, size of organization and experience, and knowledge, if any, of abrasives in reply. Address: Box 515, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

# Representatives Available

**MANUFACTURERS' REPRESENTATIVE**

Desire additional lines in foundry field, supplementing refractory lines now carried. Many years of successful, aggressive sales representation. Operations cover all California. Address: Box 510, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**SALES EXECUTIVE**

With wide contacts in metal working industries. Wish to represent high grade ferrous or nonferrous foundry in Southern New England. Address: Box 501, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

# Wanted-To-Buy

**WANTED**

4—Covered Crane Ladles—taper side—V bail—Riveted Construction. Size 26" x 26" or 27½" x 27½"—easy pouring gearing or equal. State price and condition.

**OSBORN MACHINE COMPANY**
**DUBOIS, PA.**

**WANTED**

OSBORN ROTO-LIFT
MOLDING MACHINE

MODEL NO. 3161

**PEORIA MALLEABLE**
**CASTINGS CO.**
**PEORIA, ILLINOIS**
**PHONE 2-5401**

**WANTED TO BUY**

Tumbling Barrel—side tilt—#4 SLY or equal.
Sand blast cabinet, Ruemelin AA 30 x 48 or equal.

**BOX 492, FOUNDRY**
**PENTON BLDG. CLEVELAND 13, OHIO**

**MACHINERY WANTED**

Induction Furnaces, Screens, Simpson Mixers, Riehle Compression Testing Machines, Pulverizers, Grinders, Conveyors. Address: CONDENSER SERVICE & ENGINEERING CO., INC., HOBOKEN, NEW JERSEY, BA 7-0600.

# Employment Service

**FOUNDRY PERSONNEL SPECIALISTS**

National Placement and Procurement of
**GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS.**

Confidential Inquires Invited
From Employers and Qualified Applicants.
For Fast Competent Assistance Contact

**DRAKE PERSONNEL, INC.** **FINANCIAL 6-2100**
**JOHN COPE, DIRECTOR** **7 WEST MADISON ST., CHICAGO, ILL.**

# Wanted-To-Buy

**WANTED TO BUY**

One #2 Simpson Muller, 220 V with Skip Hoist if available.
One Hough Payloader, Model HA.
Both must be in good condition.

**MICHIGAN BRASS COMPANY**
**GRAND HAVEN, MICHIGAN**

**WANTED**

1 used Keller 1 ton Air Hoist, size 86-2V-20.

**EAST END FOUNDRY, INC.**
**BOX 66 FT. DODGE, IOWA**

**WANTED**

One 6-ton Bottom Pour Geared Ladle. 57 x 51 x 57.

**CRUCIBLE STEEL CASTING COMPANY**
**MILWAUKEE 15, WISCONSIN**
**2850 S. 20th STREET**

**ALNICO SKIMMINGS (DROSS)**

Interested in offering any quantity Alnico Five Skimmings or scrap.

**BOX 509, FOUNDRY**
**PENTON BLDG. CLEVELAND 13, OHIO**

**WANTED**

Electric Melting Furnace. Top charge. For melting alloyed iron. Two to three tons per hour melting capacity. Advise manufacturer of furnace and transformer. State if electrical equipment is complete. Advise where furnace and electrical equipment can be inspected. Address: Box 518, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**WANTED**

American Wheelabrator Tumblast 20 x 27 in good condition. Address: Box 513, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**MIXERS WANTED**

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

# Foundries For Sale

**FOUNDRY FOR SALE**

GRAY IRON foundry producing castings up to 5 tons. Daily capacity 25 tons. 35,000 sq ft. building, 8 acres, RR siding. Excellent organization producing high quality machinery castings. Serves New York and Philadelphia markets.

**EDWARD H. ZOLL**
FOUNDRIES SOLD AND LEASED
**790 BROAD STREET NEWARK 2, N. J.**

# Foundries For Sale

**FOUNDRY FOR SALE**

Gray iron foundry fully equipped. Fifteen tons per day capacity. Building 18,000 square feet. Railroad siding. Ninety miles from Cleveland. Good labor market.

**BOX 528, FOUNDRY**

**PENTON BLDG. CLEVELAND 13, OHIO**

**FOUNDRY FOR SALE**

**Going foundry in Monmouth County, New Jersey. Manufacturing own line of ornamental iron castings selling through electrical and gift shop dealers throughout country. Unlimited potential for enthusiastic sales-minded person. Address: Box 478, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.**

**FOR SALE, LEASE OR PART INTEREST**

Nonferrous shell mold foundry in Midwest. 15,000 sq. ft. with buildings for expansion. Proprietary deep draw shell mold machinery. Address: Box 525, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**SMALL FOUNDRY FOR SALE**

Well-equipped foundry in Eastern Pennsylvania. Has overhead crane, cleaning equipment. Plenty of adjacent land. On railroad. Address: Box 507, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

# Opportunity

**OPPORTUNITY**

Mechanized brass and aluminum foundry has opening for young man up to 40, with technical background, acquired either through formal education or a variety of training or experience. California locality, established 1918. Small investment, eventual ownership, owner retiring.

**BOX 490, FOUNDRY**

**PENTON BLDG. CLEVELAND 13, OHIO**

**FOR SALE**

MOLDING MACHINES
1—Herman, Jolt, Rollover Draw, 6000#, 40" x 60" table.
1—Herman, Jolt Stripper, 48" x 54" table.
2—International, Jolt, Rollover Draw, 24" x 10G, Stationary.
2—International, Jolt, Rollover Draw, 20" x 8-G, Portable.
1—SPO #305 Jolt Stripper.
2—No. 275 Osborn jolt squeezers.
1—Tabor 36 x 50 table Air Jolt Rollover Draw, 3000# capacity.
2—SPO #611B stationary oscillating, jolt, squeeze strippers.

CORE OVENS
1—Coleman Recirculating 3 section with 5 drawers per section. Gas fired.
1—Coleman Recirculating 4 section with 5 drawers per section. Gas fired.
BLOWERS FOR CUPOLAS AND FURNACES
1—Connersville Rotary Blower, 3500 CFM.
2—#7½ Roots rotary blowers—27 x 81—14000 CFM.
2—Connersville Rotary 14" x 27" HD, 2750 CFM at 5# press.
1—Connersville rotary blower 22 x 66 45 cu ft. per revolution 9000 CFM.
Maxon-Premix Blowers for Gas ¼ to 1 HP.
2—5 HP 20-oz. Spencer Turbine Blowers.
2—2 HP 20-oz. Spencer Turbine Blowers.

METAL MELTING EQUIPMENT
1—1000# open flame brass melting furnace, gas fired.
1—Hausfeld Stationary Brass, oil or gas burner, 200# cap.
1—Hausfeld Tilting crucible, gas, 250# Al. Cap.
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired.

MISCELLANEOUS
1—Pangborn Rotoblast 14' dia. table with five 5' tables complete.
1—Pangborn 1 to 4 nozzle air blast generator, complete.
1—Sullivan, 2 stage compressor, 14-8¾ x 10, 75 HP.
1—20 HP U. S. Four Speed Snagging Grinder, 24" x 3" wheels.
1—International SB-11 core blower.
2—Pangborn cloth screen collectors, 2 HP.
1—Stoney crane type shakeout.
1—NC-4 Royer sand separator.
1—#1 Demmler core blower.
1—#16 Roto-clone unit complete.
Complete stock of rebuilt mill and dust exhaust blowers.

**FOUNDRY SUPPLIES 50% OFF**

| DESCRIPTION | QUANTITY |
|---|---|
| Sohio Heat #2—10 Lg. Drums (53 gal ea) | 990 Gal. |
| Ivory Sterric Acid Fl | 221 Lbs. |
| Oiless Core Binder | 30,515 Lbs. |
| Lion Core Binder | 455 Lbs. |
| 12" x 4" x ⅞" Chaplets | 99 Ea. |
| ⅝" x 12" Chaplets | 17 Ea. |
| ¾" x ⅛" x ¾" Chaplet Tinned #20 | 5,567 Ea. |
| 1 x 1 x ½" Tin Perforated Chaplets | 7 Lbs. |
| ¾" x 1" x 1" Chaplets Perforated-Peerless | 1,184 Ea. |
| ¼ x 1 Super Chills Plain Finish | 6,550 Ea. |
| ⅜ x 1 Super Chills Plain Finish | 4,000 Ea. |
| 1½" Dia. x 1½" x 3" Coils #8 Gage Chills | 1,300 Ea. |
| ⅝" x 1½" Spiral x 1½" Tail Coils #12 Ga. Chills | 2,800 Ea. |
| Pillsbury Dark Rye Flour | 600 Lbs. |
| H. &. G. Perforated Shim Gates 2 x 2 | 391 Ea. |
| Glucose or Core Syrup | 377 Lbs. |
| Glutrin | 2 Drum |
| Paraspray | 3 Gal. |
| 1¼"—6 Point Hard Iron Milling Starwood | 200 Lbs. |
| Thiemoid Chillcote | 1 Gal. |
| Esso Carbon Core Wash | 850 Lbs. |
| Esso Head Compound | 2,000 Lbs. |
| Modern Blacking 1080-45 | 1 Bbl. |
| Prepared Doco Steel Core & Mold Wash | 1 Drum |
| Olive Hill S.M. 9" 2 Arch | 160 Ea. |
| High Grade S-602-4 | 558 Ea. |
| R-50A-49 Safe Tie Short Anchor Brick | 7 Ea. |
| #1 Rockwood Silica Sand | |
| #10203 Charts F | 600 Ea. |
| Carbon Steel Ladletherm | 100 Lbs. |
| #3 Carbonite | 500 Lbs. |
| #95 Laclede Christy Sleeve Tile | 357 Ea. |
| #118 Laclede Christy Sleeve Tile | 379 Ea. |
| #117 Laclede Christy Sleeve Tile | 697 Ea. |
| No. MM-514 Laclede Christy Nozzles | 395 Ea. |
| Sets Firm | 7 Drum |
| P7 Plug Mix. | 600 Lbs. |
| Thiemoid Santroll | 5 gal. |
| Ferro Carbo | 2,850 Lbs. |
| Krome Kote | 2 Drum |
| Electro Carb Brizuetts | 14,790 Lbs. |
| Stopper Heads | 348 Ea. |
| Glucose or Cre Syrup | 377 Lbs. |
| 1 lot of Runner Tile 4 x 9 | |
| Ferro Chrome .03% Carbon | 3018 Lbs. |
| Calcium Manganese Silicon | 979 Lbs. |
| Low Carbon Ferro Manganese | 535 Lbs. |
| Calcium Molybdate | 114 Lbs. |

**CLIFTON MACHINERY COMPANY**
**1023 W. SIXTH ST. CINCINNATI 3, OHIO**

# For Sale

**FOR SALE**

| | |
|---|---|
| American Wheelabrator Tablast #3 with 4-48" tables, complete | $4250.00 |
| Pangborn #6 Rotoblast table complete | 2000.00 |
| 25—Osborn 2047-4 jolt rollovers 18" x 24" table, 8½" draw | 350.00 |
| 25—Tabor 10" squeeze molding machines | 115.00 |
| Tabor #30 Hyd. jolt rollover 30" x 40", 12" draw | 1250.00 |
| Tabor core rollover 18" x 24", 6" draw | 350.00 |
| Tabor hand rollover | 150.00 |
| Tabor core rollover, 12" x 18" | 100.00 |
| SPO-110 jolt squeeze | 220.00 |
| SPO-113 jolt squeeze | 350.00 |
| Berkshire jolt squeeze | 225.00 |
| Milwaukee jolt stripper, 36" x 36" | 1500.00 |
| Osborn 712 J, 18" x 28", 6" draw, 12" cylinder | 750.00 |
| 3—Royer portable sanditioners, large size | 150.00 |
| Gyrating riddles, 20" | 95.00 |
| Simplicity shakeout, 6' x 8' | 750.00 |
| Whiting gear ladles | 75.00 |
| Gehnrich coke oven, 5' x 4' x 7' | 300.00 |
| Gehnrich coke oven, 10' x 9' x 10' complete | 800.00 |
| 3—American Wheelabrator loaders, 27" x 36" | 300.00 |
| Spencer Turbo Blower, 16 oz., 800 CFM, 5 HP motor | 250.00 |
| Pangborn EN2 cabinet with dust collector | 500.00 |
| Rotoclone dust collector, sludge type | 750.00 |
| American Dustube No. 185, 16550 CFM complete with 25 HP motor and blower | 2000.00 |
| Dustube #35, American, complete | 300.00 |

**M. ELSTEIN**
**422-426 GRAND STREET**
**JERSEY CITY 2, N. J.**

**FOR SALE**

1—B & P Model "L" Screenarator
1—Sly #4 Tilted Blast Mill, complete unit
1—Simpson #1 Intensive Mixer, 7½ HP motor, and speed reducer
2—Fisher Type "S" Crucible Melt Furnaces, 70# Cruc. oil fired.
1—Modern 3½ Cupola with blower

**SOMIL EQUIPMENT & SUPPLY COMPANY**
**620½ MARQUETTE AVENUE**
**SO. MILWAUKEE, WIS.**
**PHONE: BR 1-7060**

**FOR SALE**

**TURBO BLOWERS WITH MOTORS**

| CFM | PRESS. | MAKE | CFM | PRESS. | MAKE |
|---|---|---|---|---|---|
| 6000 | 32oz. | Ing.-Rand | 500 | 10oz. | No.Am. |
| 4700 | 32oz. | Ing.-Rand | 340 | 20oz. | A-B |
| 4050 | 16oz. | No. Am. | 320 | 12oz. | Spencer |
| 2700 | 16oz. | Spencer | 9000 | 6"SP | Northern |
| 2500 | 7oz. | Sturt. | 5310 | 10"SP | N.Y. |
| 2000 | 16oz. | Spencer | 3420 | 8"SP | N.Y. |
| 1150 | 20oz. | No.Am. | 2500 | ½"SP | American |
| 800 | 13oz. | Buffalo | 2344 | 2"SP | Clarage |
| 525 | 48oz. | Ing.-Rand | 1100 | 4½"SP | Bayley |

**THE MOTOR REPAIR & MFG. CO.**
**1552 HAMILTON AVE.**
**CLEVELAND 14, OHIO**

**FOR SALE**

CUPOLA FURNACE—48" Dia. x 30" high—2 ton capacity, good condition, recently relined, complete with #6 Sturtevant blower, 20 HP motor and V-belt drive, extra firebrick.

**DOVER CHEMICAL CORPORATION**
**DOVER, OHIO**
**PHONE: 64622**

**FOR SALE**
**DETROIT ELECTRIC FURNACE**

Type AA of 1,200 lb cold metal or 2,600 lb hot metal capacity, complete with mechanical and electrical equipment for melting and rocking, including oil filled transformer of 11,000 v. primary and 125 v. secondary. Presently crated but available for inspection on 48 hours notice. Ideal for high test cast irons, brasses or bronzes. Price: $9,500.00. Address: HOPE ELECTRICAL PRODUCTS CO., 338 WILSON AVENUE, NEWARK 5, N. J.

**FURNACES FOR SALE**

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

**FOR SALE**

2" and 4" soil pipe machines, drop pattern type. Core machine and 100 shell type fitting patterns, snags and binders. All or any cheap. Address: HERBERT J. BROWN, 2008 PORTLAND AVE., SHREVEPORT, LA.

# CLASSIFIED ADVERTISING

# For Sale

**BUY—SELL—TRADE**

| | |
|---|---|
| 15" Continuous Wheelabrator | $4,500.00 |
| 27x36 Wheelabrator (Rubber Belt) | 2,650.00 |
| 27x36 Wheelabrator (Iron Belt) | 2,500.00 |
| 36x42 Wheelabrator | 2,250.00 |
| 48x42" Wheelabrator | 2,500.00 |
| #2 Wheelabrator Table 8" Diameter with 8 auxiliary tables 28" diameter | 3,500.00 |
| Pangborn 6' Rotoblast table 8 auxiliary tables | 3,500.00 |
| Pangborn 6' Rotoblast table with flat sigle table | 3,000.00 |
| Pangborn ES-421 Shell Blasting Machine (Like New) | 3,500.00 |
| Vapor Blast Machine | 800.00 |
| Hand Blasting Cabinets (Like New) | |
| Dust Collectors (Excellent Shape) all sizes | |

ALSO
Pressure tanks, elevators, blowers, motors, all types and sizes

**DIAMOND SAND BLAST INC.**
**5654 W. JEFFERSON AVENUE**
**DETROIT 9, MICHIGAN**
**PHONE VINEWOOD 3-6750**

**WILL SELL OR SWAP**

1—Milwaukee Jolt-Strip, #1536-12, 1500 lb. jolt capacity
1—J & J Roll-over, #815, 1200 lb. jolt, 30 x 40 Table

FOR
2—Jolt, Squeeze, Strip Machines with 18 x 18 or 20 x 30 table.

**BRUBAKER MFG. CO., INC.**
**LANDISVILLE, PA.**

**MOTORS — GENERATORS**
**TRANSFORMERS**
Unused — Rebuilt
WORLD'S LARGEST INVENTORY
**ELECTRIC EQUIPMENT COMPANY**
Phone Station Collect GLenwood 6783
P. O. Box 51 — Rochester 1, New York

**FOR SALE**

American Wheelabrator, swing table 86" diameter, complete with motors and control panel. Practically new.

**PYOTT FOUNDRY AND MACHINE COMPANY**
**328 NORTH SANGAMON STREET**
**CHICAGO 7, ILLINOIS**

**FOR SALE**

International molding machine, 31" type F Stationary Jolt Rollover, 31" x 16", Serial 14751. Hydraulic flask rack, Serial 4814-481. Can be inspected at our plant.

**THE EASTERN FOUNDRY COMPANY**
**BOYERTOWN, PA.**

**ATTENTION FOUNDRYMAN**

End your worries with water fittings. Economize with our complete line of "CONVERTO" water fitting patterns. American Standard water fittings, mechanical joint fittings, and flanged fittings made easier, simpler and at one-third the normal cost. All patterns are of long lasting aluminum construction and 100% guaranteed. Additional information and price lists will be supplied on demand. Address: Box 493, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**FOR SALE**

Two—Clearfield Sand Mullers, No. 610 complete with skip loaders, 20 HP motors, 220 volt; in operating condition.

**PITTSBURGH STEEL FOUNDRY CORPORATION**
**P. O. BOX 986**
**PITTSBURGH 30, PA.**

# America's Largest Stock of Electric Melting Furnaces!

1—1500 KVA G. E. Transformer with taps for 11,000 or 13,800 volts.

Lectromelt 1 ton Side Charge with 800 KVA, 12,000 V transformer. Late type unit. Complete. Now in our Chicago warehouse.

1—Whiting Hydro Arc 8 MT Top Charge, 5600# per hour rate of melt, 8900# capacity of well, 8" electrodes. Furnace new 1952. 2000 KVA transformer, 12,000 volts. Complete with American Air Filter, smoke hood and Whiting Bag Type Dust and Smoke Suppressor. May be seen in place Chicago.

1—Chicago 3000# Electric Furnace, tilt back head. 4" electrodes, 800 KVA, 12,000 V transformer. Complete. May be seen in place Chicago.

1—Swindell Type 6 ton 9' diameter Shell Electric Furnace, 2500 KVA transformer, 13,800 or 11,000 V. In our Chicago warehouse.

Lectromelt 500# Side Charge Type T, 300-375 KVA transformer, 2300 V primary, Moore controls, G. E. circuit breaker. Late type. Now in our Chicago warehouse.

Transformers—2—2500 KVA furnace transformers, 11,000 or 13,800 primary voltage.

1—Detroit Electric, 1500# capacity, 13,200 primary voltage. Kuhlman transformers. Complete with controls.

Detroit Electric 350#, Type LFA with Kuhlman transformers and oil circuit breaker, 13,200 primary voltage.

Detroit Electric with 350# and 1000# tapered shells, 2300 V Kuhlman Transformer. Complete with panelboard and bus bars.

Herrault 2000# Side Charge, complete with Pennsylvania 1500 KVA transformer, 12,000 volt primary and 150-90 volt secondary. New control panel; new Field Rheostat, new motor generator set-ball bearing, 25 HP, 3/60/440 V/1800 rpm, 250 V compound wound. With 51 nipples and sufficient roof brick for almost six roofs.

**ACME EQUIPMENT CO., INC.**

126 South Clinton Street, Chicago 6, Illinois
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**NO REASONABLE OFFER REFUSED FOR THE FOLLOWING EQUIPMENT:**

#70 Beardsley & Piper Speedmuller—100 HP motor; with skip hoist.
2000# Aluminum Fisher Tilting Furnace.
2000# Aluminum Stroman Hydraulic Tilting Furnace.
Dielectric Core Ovens—Model 900A & 1800A conveyor type—1949—will set up in your shop.
Osborn Core Blowers—Models 91, 94, and 193.
Herman Jar Rollover; 1944; 48" x 144"; 10,000#.
Int'l. JDP Pattern Draw; 600# cap. 8" draw.
Int'l. RES Jolt Squeeze Pattern Draw-35" table.
#275J Osborn Jolt Squeezers.
#601 Osborn Jolt Rollovers.
#605 Osborn Jolt Rollover.
#2047-4 Osborn Power Rollovers.
Tabor Molding Machine 30" x 40"
Champion Push Off; Model LLA-45; 45" x 26".
#815 Johnston & Jennings Jolt Rollover Pattern draw; 30" x 40"; 15" draw.
#918 Johnston & Jennings Jolt Rollover-Clamp, Leveler, pattern draw; 44" x 54"; 18" draw; automatic take off—no pit required—excellent cond.
1000 lb. Air Hoists.

EXTRA SPECIAL
(6) 1000 lb. Monarch Hand Tilting Furnaces Each ..... $275.00

**BALCHER MACHINERY COMPANY**
**6020 EUCLID AVENUE**
**CLEVELAND 3, OHIO**
**EXpress 1-8930**

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**FOR SALE**

1—Tinius Olsen 100,000# Universal Compression Testing Machine
1—Magnaflux Demagnetizing Unit
Simpson Sand Mixers 18" dia. Laboratory #0, #1, #1½, #2, #3.
Miscellaneous: Screens, Pulverizers, Grinders, Conveyors—all types, Tyler Rotap Screens, etc.
OUR 38th YEAR

**CONSOLIDATED PRODUCTS CO., INC.**
**66 BLOOMFIELD STREET**
**HOBOKEN, NEW JERSEY**
**HO 3-4425 N.Y. TEL. BA 7-0600**

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**FOR SALE**

Used SPECIAL BARGAIN—#401 Air Compressor, 1 Ingersoll-Rand Co. 14" x 12" Class ER1 belt driven Air Compressor #55706, 26 ft. 14" double leather belt, less motor, with many new spare parts for same. Address: DICK BROTHERS, INC., 3RD & BUTTONWOOD, READING, Pa.

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**FOR SALE**

3—International PKL Jolt Squeeze Lift Molding Machines.
1—2047 Osborn Jolt Rollover Pattern Draw.

**A. B. CHANCE COMPANY**
**210 NORTH ALLEN ST.**
**CENTRALIA, MISSOURI**

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**STEEL MELTING FURNACES**

One 350 lb. cold charge. Never used. One 60 lb cold charge. Slightly used. One 17 lb. Model PT. Slightly used. All furnaces Detroit Rocker Indirect Arc with spare shells. Complete with meter panels, switches, and transformers. All wired for 220-volt 60-cycle. Will sell or trade for M. G. Induction unit.

**FALLON INDUSTRIES**
**25800 GROESBECK HIGHWAY**
**ROSEVILLE, MICHIGAN**
**PH: PRESCOTT 7-2500**

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**FOR SALE**

1—Sprue Cutter (¾" brass capacity)
1—Whiting Hydro Blast (complete with pump and all electrical equipment)
1—American Wheelabrator Model 15 x 20 complete with dust collector
1—Redford #1 Core Blower
2—Demmler #1 Core Blowers
1—Paddle type core sand mixer

**GLAUBER WATERWORKS COMPANY**
**4520 SOUTH 36th STREET**
**OMAHA 7, NEBRASKA**

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**FOR SALE**

MOLDING MACHINE, Herman, 6000 lbs. capacity jolt, roll, draw, 42" x 78" table, 43½" draw, in good operating condition. Located in Eastern Pennsylvania. A bargain, no dealer involved. Address: Box 517, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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**FOR SALE**

Unused—1—Type 600 OTE, Timken Worm Geared Mixing Ladle mounted on four wheel bearing truck, includes ladle liner #6 Clay-graphite liner. Address: DICK BROTHERS, INC. 3RD & BUTTONWOOD STS., READING, PA.

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**FOR SALE**

2—#4 W. W. Sly Tilted Blast Mills complete with gear head motors and in good condition. Used 4 years. Address: Box 474, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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**FOR SALE**

1—#30A Whiting Unit Coal Pulverizing System ready to go. Melts heats to 50 ton.
8—Osborn #275J Portable and stationary jolt squeeze molding machines.
1—Osborn #403 jolt rollover molding machine 20" x 44" table.
1—Osborn #539 jolt stripper molding machine 25" x 32" table. 12" draw.
1—Royer Model NDP sand blender.
1—Bridgeport floor type double end ball bearing grinder 2" x 3" x 72" spindle. 18" wheels.
1—Pangborn type GJ1 Rotoblast shot blast cleaning barrel 52" dia. x 40" side dump tilting barrel, top loading ½" steel lining and loader.
1—Chapman swing frame grinder, 24" x 2½" Wheel.
1—Marschke type KXA, 18" x 3" floor type double end 3 speed grinder.
5—28" Dia. man coolers.
2—Hartzell 60" Dia. 4-blade aluminum exhaust fans.
1—Lewis ⅛" wire straightener and cut-off machine.
2—Osborn #40 rollover core machines.
1—Bell prime mover with dump bucket 1000# cap.
2—Chisholm-Moore 2 ton Cyclone Model M, 6 ft. extended hand wheel hoists.
1—36" x 48" horizontal Whiting tumbling barrel, 1" shell, spur geared 1 end.
2—Hoskins type FR252—2000° F. max. temp. electric oven furnaces, 14" x 24" x 35".
1—U. S. Electric Tool Co. model 80 double end electric disc grinder.

PHONE, WIRE, WRITE
AVAILABLE EQUIPMENT GOING FAST

**KENCROFT MALLEABLE CO., INC.**
**BUFFALO 7, N. Y.**
**RIVERSIDE 1520**

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**FOR SALE**

1—Blystone 2A (3 cu. ft.) mixer 1 H. P. 220-60-3.
1—Whiting 2500# Mixing ladle—geared—28" x 60".
1—Modern 2500# Mixing ladle—geared—29" x 54".
1—Nicholls #11-32 Jolt-squeeze-strip Molding Machine.
1—Nicholls #12 Heavy duty Jolt-squeeze-strip Molding Machine.
1—Osborn Plain Jolt #100.
1—Conveyor—2 sections Flat apron, 24" x 204" (both sections) with vari-drive 220-60-3.

**WRITE OR CONTACT:**
**J. T. MOORE**
**WELLS MFG. CO.**
**7800 N. AUSTIN AVENUE**
**SKOKIE, ILLINOIS**

# INSPECT AT OUR EXPENSE!

**Your travel expenses refunded if any machine in our warehouse is not as represented. Why don't you join the hundreds of foundries that are lowering costs and raising production with late type . . .**

## UNCONDITIONALLY GUARANTEED EQUIPMENT REBUILT BY UNIVERSAL

### AIR COMPRESSORS
1—40 HP SULLIVAN, Model B-Bim #8, WL 60 w/Receiver.
1—25 HP INGERSOLL-RAND, slow speed, horiz. ER-1, 9 x 18.

### BLOWERS
1—85 HP G.E. Cupola Blower, 24 oz.
1—40 HP SPENCER, 3600 CFM, 24 oz.
3—7½ HP FISHER, 16 oz.
15—CENTRIFUGAL BLOWERS, 350 CFM to 10,500 CFM.

### CLEANING EQUIPMENT
1—AMERICAN #1 MULTITABLE, 6 aux. tables 15", main table 45".
1—AMERICAN WHEELABRATOR, 42" x 48" TUMBLAST w/skip charger.
1—ROBBINS SHAKEOUT, 4' x 2'.
1—AMERICAN #2 MULTITABLE, 5 tables, 37" dia.
1—PARSONS Sand Blast Room, 7' x 7' x 12'.
2—SIMPLICITY SHAKEOUTS, 4' x 8'.
1—LINK BELT SHAKEOUT, 5' x 8', 5 HP Motor.
4—GRINDERS, Swing frame, 15 HP.
2—TUMBLING BARRELS, Cast Iron, 36" x 24" w/2 HP Motor.
2—TUMBLING BARRELS, Square, 34" x 48".
2—TUMBLING BARRELS, Side Tilt, 18" wide x 20" deep.

### CONVEYORS
1—HEWITT-ROBINS, Shaker Type, vibrating, 100' long.
1—JEFFREY, 28' long, 20" belt, troughing idlers.
1—LINK-BELT, 50' long, 19" rubber belt, w/drive.
1—APRON FEED, 10'7" centers, w/drive.
1—STEEL PLATE MOLD, 90' centers, 30" belt, w/drive.
2—STEEL PLATE MOLD, 90' centers, 24" belt, w/drive.
6—SAND BELT CONVEYORS, 10' centers to 140' centers, 18" to 36" belt, complete w/drives and hoppers.
2—CASTING CONVEYORS, wire mesh, 18" x 32" w/drive.
FOUNDRY TYPE ROLLER CONVEYOR—ALL SIZES—SEND REQUIREMENTS

### CUPOLAS
1—WHITING, #4, with skip charger motor and blower.
1—WHITING #6, Complete.
1—WHITING #7.
1—MORRIS #9, w-skip, mixing ladle, never used.
2—WHITING, #8, EXCELLENT CONDITION, COMPLETE.
1—MODERN, #3, 46' shell, w/blower.
1—SKIP CHARGER, 3 bottom drop buckets, blower, motor, and scale for #9 Cupola.

### CORE BLOWERS
1—CB-400 CHAMPION. 1—3K DEMMLER.
1—#55 DEMMLER. 1—#92 OSBORN.
1—FEDERAL, San-Blo.

### DUST COLLECTING
1—CYCLONE Dust Collector, 10' dia. x 22" outlet.
1—SLY, 83" wide x 43" deep x 113" high, 4' hopper, 13" inlet, bag type.

### FLASKS & CORE PLATES
400 TONS, CAST STEEL, STRUCTURAL STEEL and STERLING TYPE FLOOR FLASKS—ALL SIZES.
20 TONS, FLAT STEEL and PERFORATED STEEL CORE PLATES.
SEND FOR COMPLETE LISTINGS.

### FURNACES—DIRECT ARC MELTING
1—150#/hr. "LECTROMELT".
1—250#/hr. Hydraulic Top Charge.
1—500#/hr. "LECTROMELT".
1—1000#/hr. HEROULT.
1—1 Ton WHITING Top charge.
1—2 Ton SWINDELL, Top charge.
1—1000# SWINDELL.
1—2 Ton WHITING top charge.
2—3000# HEROULTS.
1—2 Ton HEROULT
1—6 Ton HEROULT.
Several 3 Ton to 10 Ton capacity Side and Top Charge Furnaces.

### FURNACES—DETROIT "ROCKING"
2—200# cap. DETROIT, complete.
3—350# cap. DETROIT, complete.
1—1000# cap. DETROIT, complete.
1—3000# cap. DETROIT, less transformer.
1—1500# DETROIT, Complete.
1—60# DETROIT, Complete.

### FURNACES—INDUCTION MELTING
1—20 KW AJAX Spark Gap High Frequency, 17 lb. capacity in steel.
1—25 KW AJAX HIGH FREQUENCY M. G. SET with CONTROLS, 50# CAP.
2—60 KW, AJAX-TAMA-WYATT, Alum.
1—80 KW, GE, 9600 Cy., MG Set.
3—333 KW, AJAX-TAMA-WYATT, 1500# Alum.
1—175 KW, 960 CY., MG Set, 1000# Cruc.
1—166 KW, AJAX, 60 Cy., Alum.

### FURNACES—OIL AND GAS
1—HAUSFELD Tilting #675, 250 cruc. Oil.
1—FISHER 4 Burner MNP, 1700#, gas.
3—WALKER YORK #400 cruc. tilting, coke fired.
1—HAUSFELD Tilting, 1200# Mag.
3—MONARCH Oil Fired Stat., #60 cruc.
5—FISHER 400# Tilting, Oil fired.
1—SKLENAR, 2000#, Oil Fired.

### LADLES & POURING DEVICES
2—6 TON TEAPOT, Worm Geared.
1—10 TON WHITING, Lip and Bottom Pour, EZ mechanism, used once.
4—10 TON BOTTOM POUR, 55" x 55".
2—15 TON BOTTOM POUR, 65" x 59".
2—45 TON TREADWELL, Excellent.
1—20 Ton lip Pour, 72" x 72".
1—SWINDELL, Elec. Holiding.

### MOLDING MACHINES
5—MILWAUKEE Jolt Pin Lift 32" x 38".
1—J & J #612 Port. Rollover, 24" x 30".
1—J & J #815-B Rollover.
3—INTERNATIONAL "G", 24" x 10" Jolt Rollovers.
5—OSBORN Jolt Rollovers, Hand Draw, #142.
3—OSBORN 710J Jolt Squeeze Strippers, 16" x 25" table.
1—OSBORN 276PJ JOLT SQUEEZER.
3—TABOR Jolt Squeeze in Head.
1—OSBORN #243 Jolt Rollover.
1—OSBORN #559 Jolt Stripper, 25" x 30".
1—DAVENPORT 28SA, 28" x40".
3—HERMAN Rollover & Jar, 6000#, 60" x 80".
2—HERMAN JOLT ROLLOVERS, 3000#.
10—SPO #100 J Jolt Squeezers.
11—DAVENPORT #30-T Jolt Strippers.
2—OSBORN #405 Jolt Rollovers.
2—TABOR POWER ROLLOVERS, #2242 w/clamps, late.
1—TABOR Jolt Stripper, 20" x 20", 4" draw.
1—SPO, 9336, Jolt Clamp rollover draw.

### MULLERS AND MIXERS
1—B & P MULBARO #3½.
1—SIMPSON #2, Unit Drive.
2—SIMPSON #3, Enclosed Gears.
2—CLEARFIELD #610 and #920.
1—BEARDSLEY & PIPER #60 SPEEDMULLER, 60 HP motor, SKIP-LOADER.
1—B & P Speedmuller, #40.

### OVENS
2—FOUNDRY EQUIPMENT, 2 compartment 5' wide x 6' high x 10' deep, Oil Fired, Recirculating, Walk-in.
1—FOUNDRY EQUIPMENT, Oil Fired, 4 drawers.
2—ROSS 2 comp., rack, gas, 6½" x 14" x 7".
1—CRAWFORD, Gas Fired, 3 drawers.
1—HOTPOINT EDISON, ELECTRIC, 6 drawers, 30" x 40" x 8".
1—CORE OVEN, 82" high x 6' deep x 12' wide, 2 sets of drawers, gas or oil, type baking oven, electrically heated.
1—YOUNG BROS. 3 compartment, kiln with CONTROLS.
1—MAHON ANNEALING OVEN GAS FIRED, 9' x 18' x 6½', 1600 degrees F., controls, recirculating.

### SAND CUTTERS
5—AMERICAN SAND CUTTERS—
1—MODEL "AA", 60" reel, Gas Driven.
1—MODEL "K", 72" reel, Gas Driven.
1—MODEL "F", 80" reel, Gas Driven.
1—MODEL "D", 76" x 96".
1—SANDMASTER, 70/102, New in 1950, Rubber Tires.

### SAND LABORATORY EQUIPMENT
1—TEST CORE BAKING OVEN #606.
1—MOISTURE TELLER #278T.

### SAND PREPARATORS
1—REDDY SAND UNIT.
2—JEFFREY SANDITIONERS, Portable.
5—SCREENERATORS, Size "S" and "M".
3—ROYER SAND BLENDERS, 16" belt, 12" belt, 8" belt.
1—LINK BELT REVIVIFIER, Size 5.
2—B & P SAND CONDITIONERS, portable.
1—LOWE GYRATORY RIDDLE.
1—HETHERINGTON & BERNER SAND DRYER, rotary, oil fired, #552.

### SAND SLINGERS
1—BEARDSLEY & PIPER MOTIVE JR. 19" head.
1—BEARDSLEY & PIPER TRACTOR TYPE 16" head, magnetic separator.
1—PORTABLE SLINGER, 16" head, 4' long, on Truck.

### TESTING MACHINES
1—TINIUS OLSEN, UNIVERSAL, 100,000# capacity.
1—TINIUS OLSEN, BRINELL HARDNESS, 3,000 KG.
1—RIEHLE, UNIVERSAL, 2 screw mechanical, 100,000# capacity.
1—RIEHLE, BRINELL HARDNESS, hydraulic, 3,000 KG.
1—ROCKWELL, HARDNESS, #5JR with "C" Brail.
1—BALDWIN - TATE - EMERY, UNIVERSAL, Hydraulic tensile, 24,000#.

### TRUCKS
2—CLARK, FORK LIFT, 108" lift, Gas.
1—HOUGH PAYLOADER, 1000# capacity.

**IN ADDITION: We are now liquidating several large foundries. Send your requirements today. We'll fill them!**

**UNIVERSAL MACHINERY AND EQUIPMENT CO.**

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Shillington, Reading, Pa.

# PUBLIC AUCTION SALE

## $2,500,000.00

**MODERN FOUNDRY, PRODUCTION, TOOL ROOM MACHINERY, MATERIAL HANDLING & FACTORY EQUIPMENT, OFFICE EQUIPMENT, BUSINESS MACHINES & FIRST AID EQUIPMENT**

**Formerly The Property of FERRO MACHINE & FOUNDRY CO.**

**3155 East 66th Street** — **Cleveland, Ohio**

**TUESDAY, WEDNESDAY, THURSDAY & FRIDAY, APRIL 12, 13, 14 & 15th AT 10:00 A. M. (E.S.T.) EACH DAY.**

## FOUNDRY

**Cleaning Dept.:** ES274 & ES108 Pangborn Rotoblast Shot Blast Cleaning Units; 48" x 48" American Wheelabrator; Model K American Wheelabrator Blast Cabinet; 10' x 10' Sly Blast Room.

**COMPLETE MOLDING UNIT (NEW 1951)**

Cap. 60—36" x 36" Molds Per Hour. Consisting of 2—#726 PJA Osborn Jolt Squeezes With Hydra Motors; 452' Jeffrey Car Mold Conveyor; 2 Shakeouts; 2 Elevators; 2—Pick Offs; 5 Hoists; 2 Bridge Cranes; 2 Pouring Cranes.

**Core Room:** 8 Coleman Vertical-Horizontal Tower Core Ovens (Replacement Value Approx. $350,000.00); 38 Osborn, International & Redford Core Blowers; 32 SPO & Ferro Core Draw Machines; 16 Milwaukee & Stoney Core Grinders; Continuous Car Core Conveyor (New 1951); 7 Flat Belt Core Conveyors.

**Molding Machines:** 2—Osborn 726 PJA Jolt Squeezes, Strip With Hydra Motors, New 1951; 6— Osborn 726 PJ & 724 PJ Jolt Squeezes, Strip; 14—International PK20, PKL, Nichols Type D, Stoney, SPO 113J & Osborn 74 Jolt Squeeze Pin Lift, Draw & Yoke; 9—International, Osborn & Ferro Core Rollovers.

**Melting Equipment:** Type R Moore "Lectromelt" Furnace, 2000# Per Hour; 1—2000# & 2—1000# Type DCB Stroman Aluminum Melting Furnaces; 2—#80 Iler Crucible Type Melting Furnaces; 4—#9 Whiting Cupolas; 2—3 Ton Shepard Niles Cupola Charging Cranes; 25—Charging Buckets; Atlas Bucket Scale; 4—Roots Connersville, Ingersoll Rand, Spencer & G.E. Cupola Blowers; 7—Cleveland 1 Ton Hot Metal Cranes; 100 Various Type & Size Ladles.

**Sand Equipment:** 17—Simplicity & Link Belt Shakeouts; 4—Link Belt Pug Mills; 4—Link Belt Model E 18" Rapp Sand Revivifiers; 6 Link Belt Hex Revolving Screens; Sand Conveyors; Sand Hopper With Vibratory Feeder & Bucket Elevator.

**Material Handling Equipment:** 25 Ton Style 825 CD American Diesel Locomotive Crane 55' Boom For Magnet Or Bucket Work, New 1951; 24—Towmotor, Ford, Elwell Parker, Automatic, Lewis Shepard Fork & Lift Trucks; Trojan & Lessman Front End & Highlift Loaders; Chain & Belt Conveyors; Bucket Elevators; 24—Bridge & Monorail Cranes; Hoists.

**STEEL CRANE BUILDING**

71' Wide, 249' Long, 43' High. Open Steel Frame Construction. Roof Trusses, Perlins & Crane Runway To Handle 25 Ton Crane. Equipped with 2—5 Ton Shepard Niles OET Cranes 68' Span, 33' Lift. 3 Motor DC.

**Also:** Blowers; Exhausters; Fans; Rotoclones; Laboratory; Scales; Grinders; Annealing Ovens; Casting Collection System & Cooling Tower; Welders; Pumps; And Hundreds Of Items Too Numerous To Mention.

## MACHINE SHOP

**Planer:** 42" x 42" x 8' Cincinnati Hypro Double Housing Planer, 3 Heads, Box Table, DC Motor Drive.

**Boring Mills:** #41B-24 Lucas 3" Spindle, New 1951; 2—#31 Lucas 3" Spindle; 3" Universal; Niles Bement Pond Special 2-Spindle Horizontal.

**Milling Machines—Universal:** #3 Cincinnati; #36 SU Van Norman; #FU2 SIAMP; #16 RM 4 Fray All Angle.

**Milling Machines—Plain:** #4 Cincinnati; 3—#3 Kent Owens.

**Milling Machines—Vertical:** #3, #2M1, 2—#2, 6—#08 Cincinnati; #3K, #2K, #2H Milwaukee; 2—#9J, #8½D Gorton; #14 Cochrane & Bly; #2 Brown & Sharpe.

**Milling Machines—Production:** Cincinnati #3-30 Hypromatic Duplex, #1-18, #1-12 Plain Automatic; 2—#M24, 2—#M18 Milwaukee Production; Sundstrand Rigidmill & 4—#2 Electromills; 6—#2-20, #1-14, 2—#1-8 Kent Owens Hydraulic.

**Milling Machines—Hand:** 8—#2, 7—#1M Kent Owens; 4—#6 Whitney & #1 U.S.

**Profilers:** 8—#12B Pratt & Whitney 2-Spindle; 9—#12M Morey 2-Spindle.

**Grinders—Universal:** 14" x 36" Cincinnati, Filmatic Bearings; #1 Brown & Sharpe; 12" x 36" Norton.

**Grinders—Plain:** #11 Brown & Sharpe; 2—10" x 18" Norton.

**Grinders—Surface:** #16 Blanchard Vertical; 12" Heald Rotary; #33 Abrasive; #2 Brown & Sharpe; #10 Grand Rapids.

**Grinders—Tool & Cutter:** 5—#2 Cincinnati; #13 Brown & Sharpe; #B660 K.O. Lee; #1 Norton; 2—#1 Rotorex; 2—#510 Oliver; #46 C Ex-Cell-O; #1G Sellers; #701 Hybco.

**Lathes—Engine:** 16" x 54" Monarch GH; 2—18" x 60" Cincinnati Tray Top; 21" x 8' LeBlond; 20" x 48" Lodge & Shipley; 14" x 6' Hendey; 10 Bench, Speed & Stub Lathes.

**Lathes—Turret:** 4—#5D, 2—#4D Potter & Johnston; 3—#4 Warner & Swasey; #957 Logan.

**Automatic Screw Machines:** 2—#4 Brown & Sharpe.

**Drills—Radial:** 3'11" American "Hole Wizard"; 3'9" Carlton; 3'9" Caser; 3'10" American Triple Purpose; 8—4' Hammond Jack Knife; Walker-Turner Universal.

**Drills—Multiple Spindle:** 3 Natco #30, #40 & 12-Spindle; 9—Moline Hole Hogs, 3 to 10 Spindles.

**Drills—Upright:** 40—Drills Such As #25 Foote-Burt; Cincinnati; Hamilton; Baker; Aurora; Delta; Leland Gifford; Allen; Avey & Demco.

**Saws:** #30 CX Racine; #6A Marvel; 9 x 9 And 6 x 6 Peerless.

**Air Compressors:** Type OCTDE Chicago Pneumatic 3600 CFM; Type XB Ingersoll-Rand 1200 CFM. Also 800 CFM & 600 CFM Ingersoll-Rand.

**Complete Line Of Equipment For Machining Ford Cylinder Heads Consisting Of:** Milling Machines; Drilling Machines And Cleaning Equipment.

**Also:** Shapers; Motor Generator Sets; Threading Machines; Sheet Metal Equipment; Welders; Heat Treat Equipment; Inspection Equipment; Electric Hoists; Misc. Grinders; Presses; Rotoclones; Tumbling Barrels; Shop Equipment; Small Tools And Hundreds Of Items Too Numerous To Mention.

**Complete First Aid Department Including:** Picker X-Ray Unit; Picker Fluoroscope; Stanford Stereoscope; Green Test Optical Tester; Etc. Etc. Etc.

**Large Quantity Of Office Equipment & Business Machines.**

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# INDUSTRIAL PLANTS CORPORATION

(Auctioneers, Appraisers, Liquidators)

**316 So. LaSalle Street, Chicago 4, Illinois**

**Tel: WAbash 2-7315**

**TOLEDO** — **NEW YORK**

# FOR SALE

## AIR COMPRESSORS

1—150 H.P. 800 CFM Ingersoll-Rand two-stage 230V. 3 ph. 60 cy. with air receiving tank.
1—20 H.P. 110 CFM G-E two stage, 250 V. D.C.

## AIR HOISTS

1—6 ton Detroit Pneumatic with trolley.
3—3-ton I-R, Thor, C-P
3—2-ton I-R, C-P.
1—700 # I-R.
12—Pendant Curtis Class G 1 to 3 ton.
8—Pendant Hanna 5" x 36" cyl.

## CONVEYORS

5—Bucket elevators.
2—11" belt x 33'6" and 37' centers.
1—14" belt x 51' centers.
2—20" belt x 48'6" and 56' centers.
1—Bucket elevator for coke 80' centers, double strand chain and continuous buckets.
1—Sorting conveyor, 44' centers, 30" wide steel plates, L-B chain.
18—Sand handling conveyors.
2—18" belt x 38' and 155' centers.
1—20" belt x 122' centers.
12—24" belt x 25'6", 29'6", 40'6", 45', 69', 93'93'93', 93'93'106', and 118' centers.
2—30" belt x 33' and 42'6" centers.
1—36" belt x 30'.
3—Steel Apron Conveyors.
2—30" wide x 15' and 57' centers.
1—21" wide x 5'6" centers.
Roller Conveyor—8", 10", 30", and 36".
1—Link-Belt Roller Type Power Mold Conveyor, 27' x 70'6" centers, 35 cars 38" x 72", 45 ft. per min. with frame work, take-ups, idler corners, driving mechanism, speed reducer, motor and controls.
1—Pigmold conveyor 64' sprocket centers, Link-Belt complete with drive 220/440/3/60.

## CORE BLOWERS

DEMMLER
2—#2 weight of core up to 25 lbs.
1—#2K weight of core up to 25 lbs.
1—#3 weight of core up to 35 lbs.
1—#3E weight of core up to 35 lbs.
OSBORN
9—#92 weight of core up to 35 lbs.
1—#194-1 weight of core up to 100 lbs.
REDFORD
3—Cartridge bench type.

## CRANES

1—3 ton—3 motor Bedford bridge crane, 40' span, double built up steel bridge with catwalk man cab, drum controls, roller collectors, 30 H.P. Hoist motor, 10 H.P. travel motor, 3 H.P. trolley motor, 220/440/3/60.
2—12' Cleveland hand traveling bridge cranes.
2—3 ton Shepard Cupola Charging Cranes, DC 550V. cab operated, with monorail.
Gib cranes ¼ to 2 tons.

## FURNACES AND BLOWERS

**FURNACES**
STROMAN
2—200/225 NP hydraulic tilt with blowers.
CAMPBELL-HAUSFELD
2—2000# IPNT electric tilting, 2 burners.
BELLEVUE
4—#200 with oil burner, hand tilting.
FISHER
1—#500 MNP Nose Pour, electric tilting.
2—#1000 Rotary hand tilting, oil burners.
ELECTRIC
1—6000 lbs. Heroult-Lectromelt, 3000 KVA 13200 primary volts, 239-85 secondary volts, Delta Y with taps, 3 phase 60 cycles, complete controls.
HEAT TREATING
1—G. E. 30" x 42" 1800° 37 KW 220V. 1 ph. 168 amps.
ANNEALING
1—Bellevue Combination Oil & Gas with controls.

**FURNACE BLOWERS**
3—3 H.P. 300 CFM 16 oz. 220/440/3/60.
3—7½ H.P. 975 CFM 16 oz. 220/440/3/60.
1—15 H.P. 2100 CFM 16 oz. 220/440/3/60.

**CUPOLA BLOWERS**
1—Spencer Turbine, 50 H.P., 6750 CFM, 16 oz., 220/440/3/60.
1—North-American, 20 H.P., 1950 CFM, 20 oz., 220/440/3/60.
1—Piqua Size 5½, 6000 CFM. 16 oz., 220/3/60, 30 H.P.

**EXHAUSTERS**
1—Sturtevant Silentvane, Size 75, 5 H.P., 220/440/3/60.
1—Sturtevant, Size 6, Type CS, 10 H.P., 220/3/60.
1—Roto-Clone type "D", size 10.

## GRINDING EQUIPMENT

2—Fin Cleaning Machines for cylinder heads —Ireland.
1—#230 Gardner double end disc, 30" wheels, V-belt.
3—5 H.P. Safety Emery Wheel Co., 18" x 3" wheels, 220/440/3/60.
1—10 H.P. Black & Decker dble. end 20" x 3" wheels, 220/440/3/60.
1—15 H.P. U. S. Electric double end, Model 65 double end, 4 speeds.
1—7½ H.P. Universal Swing Grinder, 220/440/3/60.
3—20 H.P. Marshke Swing Grinders, 440/3/60.
1—#24 Gardner Horizontal disc grinder, 54" diameter, 20 H.P., 220/440/3/60.
1—#19 Besly Horizontal disc grinder, 52" diameter, 15 H.P., 220/3/60.

## LADLES

MODERN & WHITING
15" to 27½" diameter, 250 lbs. to 2000 lbs. capacity with Modern type FA Pouring devices.
2 ton and 3 ton Teapot spout, E-Z Pour enclosed gearing.
2—6000 lbs. Modern Mixing ladles, elec tilt.

## MOLDING MACHINES

**JOLT ROLLOVER AND PATTERN DRAW**
DAVENPORT
2—SA-28, 1500 lbs. jolt, 12" draw, 30" x 40" table, air clamps.
2—SA-34, 2500 lbs. jolt, 15" draw, 34' x 48" table, air clamps.
1—SA-40, 3000 lb. jolt, 18" draw, 40" x 60" table.
HERMAN
1—6000 lbs. jolt, 42" x 60" table, air clamps, pit type.
JOHNSTON & JENNINGS
1—918, 18" draw, 2000 lbs. jolt, 44" x 54" table.
OSBORN
2—405-95, 26" draw, 3500 lbs. jolt, 40" x 60" table.
2—602, 36" flask, 600 lbs. jolt.
6—601-13, 10" draw, 900 lbs. jolt.
8—2047-4, 8" draw, air clamps.
1—422 with swing out table.
SPO
1—9336, 9½" draw, 800 lbs. jolt, 22" x 28" table.
TABOR
2—22" x 32" table, 10" draw, 6000 lbs. jolt, air clamps.
1—24" x 42" table, 10" draw, 600 lbs. jolt, air clamps. Never used.

**JOLT SQUEEZE PIN LIFT**
INTERNATIONAL
1—LJSK Hand lever pin lift, 6" draw, 18" x 24" table.
MILWAUKEE
1—145-1, 8" draw, 1700 lbs. jolt, 25" x 30" table. 14" squeeze cyl.
4—4" draw, 11" squeeze cyl., 17" x 21" table.
OSBORN
2—S14-P Stationary, 8" draw, 700 lbs. jolt, 14" squeeze cyl.
1—714PJ Stationary, 7" draw, 20" x 31" table, 14" squeeze cyl.
5—720 Stat., 4" draw, 11" squeeze cyl., 19" x 22" table.
1—721 Stationary., 6" draw, 13" squeeze cyl., 22" x 26" table.

**JOLT SQUEEZERS**
HAYNES
INTERNATIONAL LJS
MILWAUKEE 124-6, 103
MODERN
OSBORN 275J, 210PJ
SPO 113P
TABOR

**JOLT STRIPPERS**
INTERNATIONAL
1—JFL Foot lever lift, 3" draw, 600 lbs. jolt, portable.
3—LP-6, 8" draw, 1000 lbs. capacity. Pine adj. 16" to 24".
JOHNSTON & JENNINGS
1—68SP, 8" draw, 600 lbs. jolt, 25" x 30" table, portable.

OSBORN
1—559, 6" draw, 1200 lbs. jolt, 25" x 30" table.
1—559-HD, 6" draw, 1200 lbs. jolt, 25" x 30" table, portable.
1—561-41, 12" draw, 5000 lbs. jolt, 40" x 50" table, pit type.
HERMAN
2—40" x 60" table, 6000 lbs. jolt.

**ROCKOVER AND DRAW**
INTERNATIONAL
4—"R" hand ram, hand rollover, 8" and 10" draw.
3—"RJ" power jolt, hand rollover, 8" draw, 14" x 20" table.
MODERN
2—2-38 hand ram, hand rollover, hand draw.
OSBORN
1—147-1, 20" x 60" core box max.
1—146, 24" x 32" core box max.
PRIDMORE
2—hand ram, power rollover.
SPO
1—506, 24" x 25" table, 600 lbs. jolt, 10" draw, stationary.
CHAMPION
2—Type 4 22" hand rollover, 12" draw.
1—Type W 16" hand rollover, 8" draw.
PUSHOFF
2—size 38" x 40" Champion, 10" draw.
1—Osborn 3' x 16' table.
PLAIN JOLT
1—Osborn No. 98, 220 lbs. jolt, 12" x 12" table.
1—Tabor Model B-4, 700 lbs. jolt, 18" x 24" table.
1—Tabor Model B-6, 1300 lbs. jolt, 36" x 36" table.
2—International, Type J, 1300 lbs. Jolt, 31" x 44" table.
1—International, Type J, 3000 lbs. jolt, 36" x 48" table.
1—International, Type J, 10,000 lbs. jolt, 76" x 76" table.
SHELL MOLDING MACHINE
1—Shalco, Model CO-1, ser. #79, new condition.

## SCALES

TOLEDO
1—6500 lbs. dial floor scale, 5' x 7' platform.
FAIRBANKS-MORSE
2—Printomatic dial scales.
1—Core Sand scale with hopper.

## SAWTABLE

TABOR
1—Abrasive cutoff, 10 H.P., 220/440/3/60.

## SAND SLINGERS

1—Motive Junior Beardsley-Piper, 19" head, 4" tip, 220/3/60.

## SHAKE-OUTS

ROBBINS
1—4' x 10', 12,000 lbs. capacity with 7½ H. P., 220/440/3/60 "Floatex".
MIDWEST
1—120' x 36" Apron shakeout conveyor.

## SAND MULLERS

SIMPSON
2—#2 Model H, Type E with skip bucket, 220/440/3/60, 20 H.P., 14 cu. ft.
1—#3 Model H, Type E, 220/440/3/60, 60 H.P., 30 cu. ft.
3—#3 Model C, Type E, 220/440/3/60, 60 H. P., 30 cu. ft.
BEARDSLEY-PIPER
2—#70, 29-58 tons per hour, 18 cu. ft. per batch, 100 H.P., 220/440/3/60.
1—#30, 6½-13 tons per hour, 4 cu. ft. per batch, 20 H. P., 220/440/3/60.
LINK-BELT
1—Paddle type, 20" x 72".
1—Pugmill, 42" x 96".
BLYSTONE
1—#2A—5 cu. ft., 3 H.P., 220/440/3/60.

## SAND CONDITIONERS

ROYERS
2—C-2, 10 to 15 tons per hour, 1½ H.P., 1750 RPM motor.
LINK-BELT
1—Aerator with drive and motor.
RAPP
1—No. 27 Revivifier.
AMERICAN
2—Sand Cutters, Type AA, 4' 8" and 5' 2", 220/440/3/60.
1—Sand Cutter, Type 74-50 "AM", 440/3/60.

## SAND BLAST EQUIPMENT

AMERICAN WHEELABRATOR
1—42" x 48" Wheelabrator, 200/440/3/60.
1—36" x 42" Wheelabrator, 220/440/3/60.
1—6' Tablast, 220/440/3/60.

## MAGNESIUM CLEANING CABINETS

8—Cabinets, 8000 CFM with Buffalo Exhausters, 7½ H.P., 220/440/3/60.

## TUMBLING MILL

1—Sly Model 00 tilting type barrel with shot return.

**EUCLID FOUNDRY & MACHINE EQUIPMENT COMPANY**
14919 SARANAC ROAD — TELEPHONE: GLENVILLE 1-1222 — CLEVELAND 10, OHIO

# FOR SALE

### AIR COMPRESSORS

Ingersoll Rand Type 10—14 x 9 x 12, 2 stage, 75 HP, 3/60/220/1200 rpm synchronous motor, 350 CFM at 100#.

5 x 5 Ingersoll Rand 10 HP motor.

Ingersoll Rand Type 10, 800 CFM, XRB2, 16" stroke 20" x 12½" cylinder, 2 stage compressor, 206 HP, 220 volt motor, with starter and air receiver. Complete. This unit was rebuilt in 1952 by Earl Knox Co.

Ingersoll Rand Type 10, 800 CFM, 2 stage air compressor, 200 HP, 220 V motor. This is an older unit. No starter or air receiver. Overhauled in 1951.

Sullivan Vertical Single Stage 100 HP air compressor, 220 volt motor, with starter and air receiver.

### BLOWERS

Spencer Turbo Blower, 2250 CFM at 16 oz. 15 HP 3/60/220 totally enclosed motor. New 1947.

Ingersoll Rand Motor Blower Type FS. Single Stage 4000 CFM @ 3.75 PSI, 100HP, 220 V, G.E. Induction Motor.

Buffalo 7E Direct Connected Blower, 50 HP Westinghouse motor, 3/60/220-440 V, 3535 rpm, 28" wheel, 3500-4000 CFM at 32 oz. Flanged outlet.

General Electric 7500 CFM, 20 oz., 89.6 Max HP, 220 V motor. Airway controls.

### CLEANING EQUIPMENT

Sly 8' Dia. Table Shot Blast Unit.

### CONVERTER

100 KW Rotary Westinghouse 220 V 60 cycle primary 250 V DC, complete with controller and panel.

### CORE BLOWERS

International SB 13.
Federal Sandblo CB40B, like new.
Demmler #50.
Peterson Core Blower (Similar to Demmler #50).

### CRANE LADLES, GEARED

1—42" x 47" Crane Ladle.
2—44" x 44" Crane Ladles.

### CRANES

5 Ton P & H Overhead Elec. Traveling Crane 30'6" span, 15' lift (can be increased) 3 motor, 220 V A.C. New 1946.

### CRUSHERS—PULVERIZERS

1—Stedman 15" x 12" Type A. With 10 HP 220-440 V motor.

### DUST COLLECTORS

Whiting Dust Suppressor, bag type, 12,000 CFM, 30 HP motor to handle hot fumes from electric furnace hood, New 1953. Cost us over $14,000 before erection and without wiring or duct work.

### GRINDERS, DISC

Besley 208 Double End 26" x 2⅜" wheel with 2 compound tables, V belt drive, 15 HP, 220-440 totally enclosed motor magnetic starter controls.

2—U. S. Model 80 Double End 2-18" dia. wheels, 7½ HP motor, 2 swinging tables 8" x 14"—1 with hand lever feed.

### GRINDERS, SNAGGING

McCabe 2" x 24" wheels, 48" between wheels, 3/60/440 V.

1—Hammond type 20 WR2—3" x 24" wheel, double end grinder, single speed, 20 HP Louis Allis Squirrel Cage, 220-440 V—1760 rpm motor.

1—U. S. DE, Model 65, 3" x 24" wheels, variable speed, 20 HP motor.

Kling Bros. 30" Double End Snag Grinder, heavy duty, 15 HP motor.

Kling Bros. 18" Double End Snag Grinder, heavy duty.

### GRINDERS, SWING

2—Fox 10 HP 3/60/220-440 V, Swing Frame.

U. S. 15 HP, 3/60/440 V Swing Frame, 2 speed.

Fox 15 HP Swing Frame, 2 speed.
Marschke 20 HP, 2 speed.

### HOISTS

1000# Cleveland 220/440 V.
1000# Detroit 220/440 V.
5—1000# P & H Hevi Duty with trolley.
11—4000# P & H Hevi Duty with trolley.
2—4000# P & H Hevi Duty with trolley and powered drive unit for moving hot metal.

### LADLES

1 Ton Enclosed Gear Crane Ladle truck type 4 wheel car for 18" gage track, Whiting Junior.

### MOLDING MACHINES

1—Johnston & Jennings 1015 Jolt Pin Lift. 30" x 38" table.

1—Champion Hand ram, hand clamp, hand rollover 26" x 14" table.

1—Champion Hand Ram, Hand rollover, Hand draw core machines, 15 x 15 bed.

2—Champion Pin Push Offs, 10" draw, 28" x 42" table.

3—Davenport Portable Jolt Rollover Pattern Draw 20" x 24" tables, open end, 8" draw.

1—International Type G 24 x 10 Jolt Rollover foot draw, 22" x 30" table, 10" draw.

1—Herman Molding Machine Jolt Rollover Pattern Draw, 20 x 30.

1—Herman Molding Machine Jolt Rollover Pattern Draw, 20 x 36.

1—International Type G 30 x 12 Jolt Rollover Foot Draw, 28" x 36" table, 12" draw.

1—International Type G 30" x 30" table, 9" draw, Portable.

2—International Type G 18" x 56" table, 8" draw. Portable.

1—International Type F Jolt Rollover 27 x 12, 12" draw, 35" x 26" table.

1—International Jolt Rollover Pattern 10" Draw, 22" x 30" plate, 6" jolt cylinder.

1—International Plain Jolt Molding Machine 48" x 60" table, no pit required.

1—Herman Jolt Rollover Pattern draw, 40" x 84" table, slotted nickel alloy table over reguar table to accommodate various sized flasks, air clamp, new 1946. Used very little.

1—Herman 20" x 30" rollover pattern draw, 750# series. Air clamp.

2—Herman 20" x 24" Jolt Rollover Pattern Draw, 750# series. Air clamp.

1—Herman 4000# Series High Speed Rollover 30" x 60" with 32" x 48" bumper, 13" cylinder pattern device.

2—Milwaukee Arm Type Jolt Squeeze Strippers, 1500# capacity, Model 163-50 Serial 13104-5, 15" x 24" table, 16" x open end, pattern size. Late type.

1—Osborn 76J Portable Jolt Squeeze Molding Machine 12" cylinder.

2—Osborn 405 Jolt Rollover 40" x 70", 2000# capacity, 20" x 60" jolt table and 4 wheel receiving car.

1—Tabor 1000# Rollover, 30" x 60" table.

4—Spo 214 Jolt Squeeze Pin Lifts.

Milwauk 2542 Jolt Stripper, 38" x 42" table. Serial 14805.

### MULLERS AND MIXERS

Simpson #2 Motor on base.
Simpson #3 Motor on base.
Simpson #3 Type H open gear type.
Simpson #3 Open Gear Type $1000.00.
Simpson #3 Muller with bucket loader.
American Model M Sand Cutter 70" blades.
Royer NDP 47 14" Belt, 4 rubber tires.
B & P Speedmuller 80 w/cooling blower.

### PREPARATOR

B & P #70 Preparator. Only used 3 months.

### RIDDLES

Champion Sand Riddle, floor type.
Universal Sand Riddle.

### ROTOBLAST

Pangborn, table with 3-8" rotating work tables, 3 position loading, cleaning and touch-up designed for work similar in size to aircraft cylinders. Like New condition.

### SAND HANDLING EQUIPMENT

Blaw Knox Sand Grab Bucket for crane use.

### SAND SLINGER

B & P Stationary, 19" head w/bucket elevator feeder.

### SAWS

Crescent Band Saw, 30" cap., w/3 HP 220-440 V motor.

### SHAKEOUTS

2—4' x 6' Simplicity.
1—4' x 6' Simplicity, 15,000# capacity.

### SPEED REDUCERS

We have a large stock of speed reducers and geared head motors. Write us your needs.

### WHEELABRATORS

1—American Wheelabrator 48" x 48" with loader, 220/440 V motors.
1—American Wheelabrator 36" x 42" with loader, 220/440 V motors.

### WIRE STRAIGHTENERS

Lewis #7 Wire Straightener and Cutoff w/1 HP AC motor.
Climax #3 Core, Rod Straightener, ¼" to ⅜" cap. with 2 HP motor.
Climax #2 Core, Rod Straightener, ⅛" to ¼" cap. with 1 HP motor.

### FLASKS

**Hines Popoff and Jackets**
**1st Figure is Depth of Cope**
**2nd Depth of Drag**

2—10" x 17" flask 4/3
1—10" x 18" flask 5/4
1—11" x 16" flask 5/4 1/2
1—11" x 22" flask 5/4
1—12" x 12" flask 5/3 1/2
1—12" x 16" flask 5/7
2—12" x 16" flasks 6/5
1—12" x 16" flask 7/5
1—12" x 16" flask 7/7
1—12" x 16" Extra 4½" drag
13—12" x 16" C.I. Jackets
1—12" x 18" flask 5/4
2—12" x 18" flasks 6/6
1—12" x 18" flask 7/7
1—12" x 18" extra drag 5"
1—12" x 18" extra drag 7"
11—12" x 18" C.I. Jackets
1—12" x 20" flask 5/5
1—12" x 20" flask 5/7
1—12" x 20" flask 7/5
1—12" x 20" extra 5" drag
2—12" x 20" C.I. Jackets
2—12" x 22" flasks 5/5
8—12" x 22" C.I. Jackets
1—12" x 30" flask 5/5
11—12" x 30" C.I. Jackets
1—14" x 28" flask 6/6
1—15" x 18" flask 5/3 1/2
1—16" x 21" flask 6/5
1—17" x 17" flask 6/5
1—19" x 19" flask 5/4
1—20" x 20 flask 6/6
2—24" x 24" flask 8/8
1—24" x 24" 3" drag upset
1—24" x 24" extra 6" cope upset
3—24" x 24" C.I. Jackets
1—24" x 28" flask 6/6 1/2
2—34" x 34" flasks
10—34" x 34" C.I. Jackets

## ACME EQUIPMENT CO., INC.

**WE WILL BUY FOR CASH A SINGLE PIECE OF EQUIPMENT OR YOUR ENTIRE FOUNDRY**

**126 South Clinton Street  Phone: Andover 3-3430  Chicago 6, Illinois**

# MACHINERY & EQUIPMENT CO.

**15539 SARANAC ROAD — CLEVELAND 10, OHIO — CALL LI. 1-6565**

## AIR COMPRESSORS

1—**BURY** Class URB, size 8 x 8, single stage horizontal, 180 CFM, w/30 HP motor.
1—**CHICAGO-PNEUMATIC** Size 8 x 8, single stage Horizontal, 180 CFM w/30 HP motor.

## AIR & ELECTRIC HOISTS

22—**INGERSOLL-RAND** Air Hoists, 700 lbs capacity through 10,000 lbs, all sizes and models, latest type, with trolleys or hooks for hanging.
1—**COMET** 1000 lbs capacity, electric 220V.
1—**DETROIT** 5 ton cap. Model LHR.
1—**ELECTRO-LIFT** 3000 lbs cap. 4 HP motor.
1—**SHAW-BOX** Load Lifter Jr. 1000 lbs cap.

## BUCKET ELEVATOR

1—**JEFFREY** 50' centers, 106' rubber belt 13" width, w/ Jones Reducer & motor etc.
1—**BOHN** 8½' centers, 5" belt, with buckets motor & drive.

## CORE BLOWERS

2—CB-400 **CHAMPIONS.**
1—#1 **DEMMLER.**
2—#91 **OSBORNS.**
1—**DEMMLER 3K.**
2—#91 **OSBORN.**
1—#192 **OSBORN.**
1—**FEDERAL** CB-40 San-Blo—1951 Unit.

## CUT-OFF SAWS & STRAIGHTENERS

2—**TESSMER** Model H Sprue Cutters.
1—**CLIMAX** #2A Wire Straightener.
1—**AMERICAN** Type D Rod Straightener & Shear, ¾" shear, 1¼" straightener, 1952 unit.

## CONVEYORS—ROLLER-BELT—TROUGH

1—**FARQUHAR** 18" x 35' portable Trough.
1—**FARQUHAR** 18" x 19' Car Unloader.
5000'—**MATHEWS** Gravity Roller Conveyor, 10"—16"—18"—24" width rollers, standard & heavy duty, FOUNDRY TYPE, all above rail.
2—**POWER BELT** 30' length, 16" width Mathews Roller conveyor & rubber belting, motorized.
1—**POWER** Belt 30' length, 24" width **MATHEWS** Roller Conveyor, rubber belt, motorized.
2—35' x 24" **TROUGHING,** with idlers, belting, pulleys, motorized.
190'—**LOUDEN** Mono-Rail—4—20' bridges.
1—**LINK-BELT** Overhead Conveyor, 100' track, chain, trolleys, curved, motorized, NEW.

## CUPOLA & FURNACES BLOWERS

1—**INGERSOLL-RAND** Centrifugal Type FS-367 with 100 HP motor.
1—**BUFFALO** No. 7E—25 HP, 28" wheel.
7—Furnace Blowers 1-3-5-7½ HP, 16 oz.

## HEAT TREAT & ELECTRIC FURNACES

1—**LINDBERG** Model 4860GH, Cyclone Type Gas fired, with all controls.
3—**DETROIT** Type AA Rocking 1500 to 2000 lbs, w/400 KVA Transformers.
2—**DETROIT** Type AA Rocking 750 to 1000 lbs, w/250 KVA Transformers.

## GAS & OIL FIRED FURNACES

3—**LINDBERG-FISCHER MNP** Size 2400 lbs gas or oil fired, motorized, complete.
1—**LINDBERG-FISCHER MNP** Size 225 lbs, gas or oil, w/motor-blower etc.
2—**LINDBERG-FISHER** Type BBI, 400 lb crucible type, hand tilt, gas or oil.
1—**STROMAN** Model U, 600 lbs Reverberatory, tilting, gas or oil fired.
2—**STANDARD** #30 & #150 Crucible, Stationary, gas or oil, w/motor-blower.
1—**HAUSFELD** #200 Crucible, stationary, gas fired, NEW 1952.

## G. E. INDUSTRIAL X-RAY

Model KX 10, Type 1, 115 volts, 50/60 cycles, 13 amps. Serial 425456.

## GRINDERS—SWING—SNAGGING—STAND

2—**FOX** #5 High Speed Stand, wheel 24" x 3"—10 HP motor.
1—**FOX** #7 High Speed Stand, wheel 30" x 3"—15 HP motor.
1—**HAMMOND WR-1** Double End Snag, wheel 24" x 3"—10 HP motor.
1—**MARSCHKE** 3 HP Swing Frame, 2-speed.
2—**MARSCHKE** 15 HP Swing Frame, 2 speed.
1—**MARSCHKE** 20 HP Swing Frame, 3 Speed.
1—**QUEEN CITY** #100 Double End Disc.
1—**STANDARD** #30—Model 101 Double End Multi-Speed—wheel 24" x 3"—10 HP.
1—**U. S.** Electric Swing Frame, 15 HP, 2 speed, wheel 24" x 3" x 12".
6—**U. S. ELECTRIC** #65 Snag Grinder, 15 & 20 HP models—4 speeds, max. wheel 30" x 4".

## LADLES & POURING DEVICES

6—**INDUSTRIAL** Lip Pour 24" x 24" rated 1600 lbs. enclosed Timken Gearing.
6—**MODERN** Model FA-9 Pouring Devices w/500 lb. ladles, trolleys & tilt devices.
2—**MODERN** Mixing Ladles, 40" x 60", on trunnions, geared, covered, lined.
4—**MODERN** 1500 lb. Cylindrical Type, 29" x 30", w/bails, covers & stands.
10—**WHITING** Models 1000 & 2000 Pouring Devices w/500 lb ladle, hand tilt.
3—**WHITING** Crane Type ½ & 1 ton cap.

## MOLD CONVEYOR

**PALMER** "B" 200' track, 80 cars, 18" x 42", with all drives and motors etc. Both straight and curved track.

## MOLDING MACHINES

1—**DAVENPORT** #28 RO Jolt Rollover & Pattern Draw 30" x 40" table, 12" draw.
2—**INTERNATIONAL** RES Jolt Squeeze Rollover Draw, Size 15" x 8" draw.
1—**INTERNATIONAL** PKL Jolt Squeeze Strip, 18" x 24" table, 6" draw.
2—**INTERNATIONAL** G, Jolt Rollover Foot Draw, 18" x 56" & 20" x 8" size, draw 8".
1—**INTERNATIONAL** LP-10 Jolt Pin Lift.
2—**MILWAUKEE** No. 124 Jolt Squeeze, 12" cyl.
5—**OSBORN** #275J Jolt Squeezers, 10" cyl.
2—**OSBORN** #710J Jolt Squeeze Pin Lift, 16" x 25" table, 6" draw, 10" squeeze cyl.
2—**OSBORN** #712PJ Jolt Squeeze Pin Lift, 18" x 28" table, 6" draw, 12" squeeze cyl.
1—**OSBORN** #342-1 Jolt Rock-Over Pattern Draw, 23" x 38" table, 10" draw, 1000# Jolt.
3—**OSBORN** #559 Jolt Strip, 25" x 30" table.
2—**OSBORN** #405 Jolt Rollover, table 57" x 64", 26" draw, 3000 lbs jolt cap, w/roll-out.
2—**OSBORN** #406 Jolt Rollover, table 42" x 82", 26" draw, 7500 lbs jolt cap. w/roll-out.
3—**OSBORN** #721 Jolt Squeeze Pin Lift, 22" x 26" table, 6" draw, 800 lbs. jolt.
4—**OSBORN** #210 PJ Jolt Squeeze 16" x 20" table.
5—**OSBORN** #601 Jolt Rollover Pattern Draw, 600 lbs jolt cap., 30" flask size, 10" draw.
6—**OSBORN** #602 Jolt Rollover Pattern Draw, 22" x 36" table, 10" draw, 750 lbs Jolt.
2—**OSBORN** #142 Jolt Rollover Hand Draw.
4—**OSBORN** #40 & #42 Hand Core Rollovers.
2—**HERMAN** Jolt Rollover Pattern Draw, 6000 series, 42" x 78" table, 6000 lbs Jolt.
2—**HERMAN** 40" x 60" Plain Jolt.
2—**JOHNSON & JENNINGS** #815-B Jolt Rollover Pattern Draw, 30" x 40" table.
2—**TABOR** 22" x 42" Shockless Jar Rollovers.
2—**TABOR** 30" x 40" Shockless Jar Rollovers.
2—**SPO** #506 Jolt Rock-Over—24" x 25" table.
2—**SPO** #507 Jolt Rock-Over Pattern Draw, 32" x 40" table, draw 10 to 20".
1—**SPO** #508 Jolt Rock-Over Pattern Draw, 28" x 30" table, 9" draw, 1200# jolt.
1—**SPO** #413-D Jolt Squeeze Rock-Over Draw, 24" x 25" table, 10" draw, 600# jolt.
1—**SPO** 213-D Jolt Squeeze Strip, 19" x 28" table, 8" draw, 800 lbs Jolt.

## SAND MULLERS

1—**BEARDSLEY & PIPER** #60 Speed Muller, 10 cu. ft. with 50 HP motor.
1—**BEARDSLEY & PIPER** #30 Speed Muller.
1—**BESSER** 36" x 42" Blade Type Mixer, horizontal drum, 12 cu. ft., w/7½ HP motor.
2—2500# capacity Sand Larry, portable, w/Fairbanks Morse Dial.
3—**SIMPSON** #2 style UD—6' pan diam. 1500# batch, with skip loader, water meter, latest type.
5—**SIMPSON** #3 style C, separate drive enclosed gearing 8' pan diam, 3000# batch, w/motor & reducers.

## SAND BLASTING EQUIPMENT

1—**HYDRO-BLAST** Type M, Wet Abrasive, 7'5" v 4'5" x 8', door opening, 40" x 28", w/tank, 40 HP motor etc.
1—**PANGBORN** #7GK-2 Rotoblast Barrel, 30" x 38" drum, 7 cu. ft. cap. airless type, w/skip hoist.

## SAND PREPARATORS

3—**B & P** Model M Screenerators.
1—**B & P** #70 Portable Preparator w/gyrating screen, aerator, magnetic separator, 90 cu. ft. hopper.
1—**AMERICAN** Model AM Cutter, size 69/45.
1—**AMERICAN** Model BD Cutter, size 75/60.

## SAND SLINGERS

1—**B & P** 19" Tractor Type, 13' arm.
1—**B & P** 16" Tractor Type, 13' arm, magnetic tower, 4' ramming 4" tip.

## SHAKEOUTS & SCREENS

1—**ROYER** Combination Shakeout & Sand Conditioning unit, serial #ST-47.
4—**SIMPLICITY** 4' x 6' Model B, 5000#.
1—**SIMPLICITY** 2' x 3' Model CA-VM Gyrating Sand Screen, 1 HP-V-belt drive.
1—**SIMPLICITY** 4' x 10' Model D with Automatic Crusher, 15,000 lbs load rating.
1—**HUMMER** Vibrating Screen 3' x 5'.
1—**STONEY** Core Knock-Out 8" x 20" head.

## SAND RIDDLES

10 — **UNIVERSAL** "Roto - Plane" Speed sifter, 20" diam, with 1/3 HP motor.
1—**COMBS** Type V Gyrating, 20" dia, 1/6 HP.

## TUMBLING BARRELS

5—**SLY** 36" x 60" with 5 HP Gearhead motor—built in magnetic brake.
2—**SLY** 42" x 72" Square, with 10 HP Gearhead motor — built in magnetic brake.
1—**SLY** 42" x 66" Type C—10 HP motor.
1—**SLY** 24" x 36" with motor & drive.

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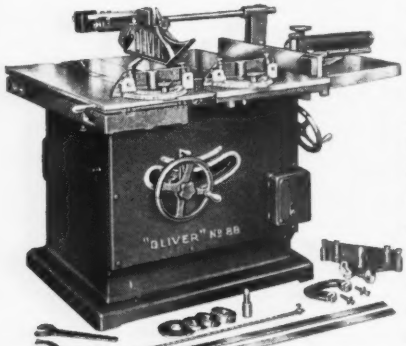
# Saw those large sections of patterns with ease on this "OLIVER"



The saw arbor tilts to any angle up to 45° permitting the operator to rip, cross-cut, miter or dado while work is flat on table. An 18-inch saw projects 4¾" through table which has 4¼" vertical movement. Rips up to 50"; cross-cuts 48"—1" thick. Has most accurate set of graduated gauges. Write for Bulletin No. 88-D.

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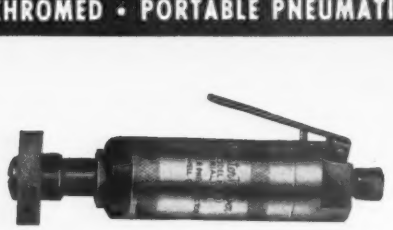

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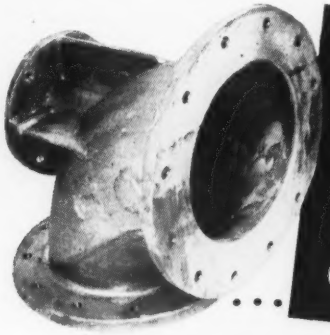

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PLANTS IN ALL PRINCIPAL CITIES

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CITY..... STATE.....

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Combs Gyratory Foundry Riddles combine smooth, even motion with fast, low-cost operation!

Whether you screen core or molding sand, you'll find that Combs Riddles provide thorough sifting, mixing, aerating—whatever the job calls for.

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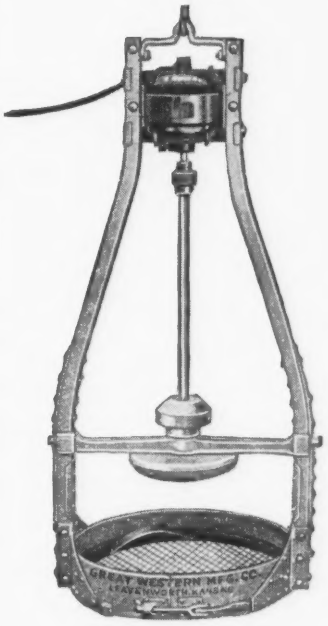
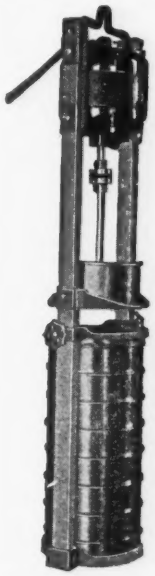



**Type "V"**

with 20" sieve $250.00
also made with
36" sieve ..... $450.00



**Type "HL"**

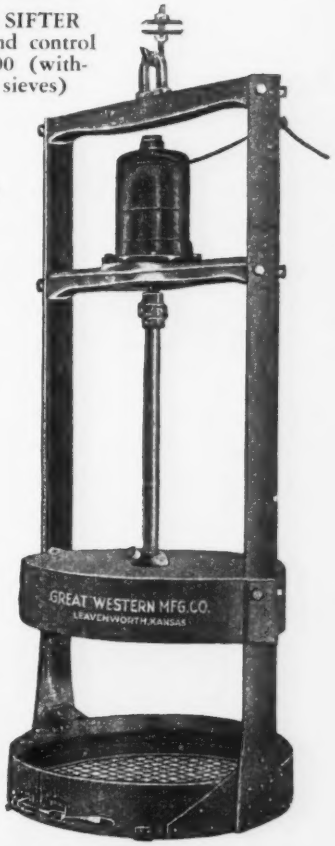
LAB SIFTER
for sand control
$225.00 (without sieves)

**Type "CS"**

with 24" square screen and automatic discharge
$320.00

**Type "CR"**

with 24" sieve
$310.00




These Combs Foundry Riddles cost less than 1¢ an hour for power. You can remove the steel rim, empty it and replace it in just seconds. You save up to 97% on your labor costs.

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**GREAT WESTERN**
**MANUFACTURING CO.**
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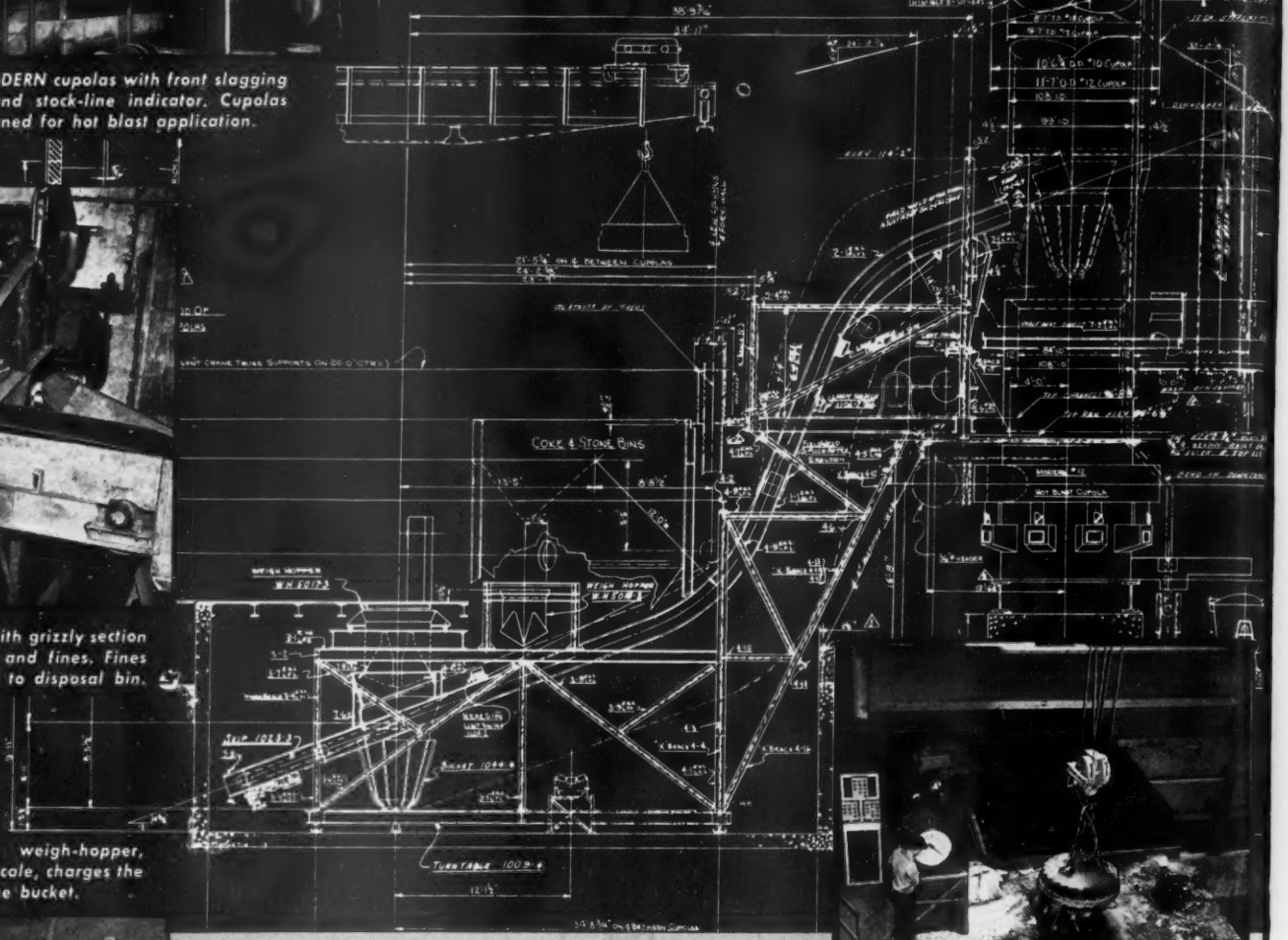
# MODERNIZED

Four, MODERN cupolas with front slagging system and stock-line indicator. Cupolas are designed for hot blast application.

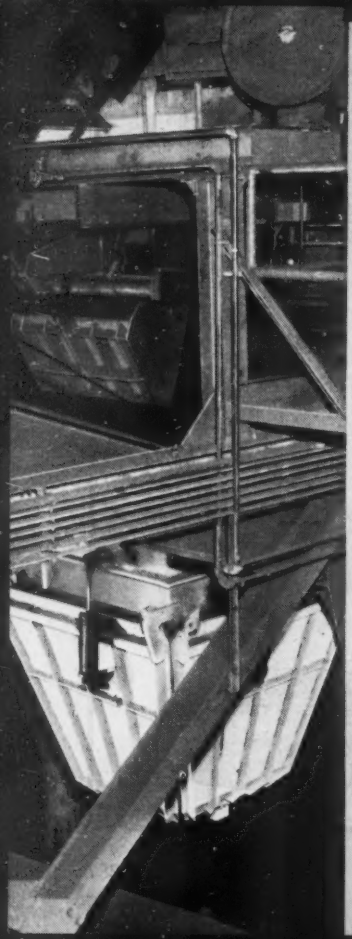
Vibratory feeder with grizzly section eliminates breeze and fines. Fines are belt conveyed to disposal bin.




Coke and stone weigh-hopper, mounted into the scale, charges the MODERN small-cone bucket.

Elevation drawing to indicate the location of equipment inside the foundry and relation of charger to the yard crane.

Iron is charged by MODERN magnet crane.



## CONSULTING...ENGINEERING...MANUFACTURING...ERECTION

From start-to-finish this 100%, MODERN installation is helping to control automobile costs for one of America's foremost builders*. Here under one roof the new, MODERN-ENGINEERED charging and melting system is producing the gray iron for less and faster, too:

- All charging operations are controlled by two men . . .
- Conveying the coke and stone from bins to coke and stone weigh-hopper, weighing and recording are done automatically . . .
- MODERN stock-line indicator maintains the charge-level at its maximun, melting efficiency . . .
- Swivel charger serves two cupolas at one charger-cost . . .
- MODERN-HYDRO-WASH—flushing away of ash and slag from stacks and spouts to the settling tanks—reduces disposal costs . . .

In every way it pays to ask about the single responsibility which MODERN has proved to be more profitable and most satisfactory for all foundries both large and small . . .

*Nash Motors Division, American Motors

MODERN

**MODERN EQUIPMENT COMPANY**
**Department F-4 Port Washington, Wisconsin**
**REPRESENTATIVES IN ALL PRINCIPAL CITIES**

# FOR CLEANER FOUNDRY OPERATIONS . . .

## . . CHECK THESE STEVENS PRODUCTS

Cleaner foundries, the goal of foundrymen everywhere, mean better and healthier working conditions and improved employee relations. Cleanliness contributes, too, toward another goal of foundrymen – increased, more efficient production at lower costs. As contributions towards attaining these goals, Stevens offers these proved products:

- **STEVENS KLEENAIR SEACOAL—STEVENS KLEENAIR KING KORE COMPOUND** – These basic products, Seacoal and Pitch Compound, have been treated to make them dustless. Dust has been reduced to a small fraction of the amount created by ordinary Seacoal and Pitch.
- **STEVENS SNO-WHITE NON-SILICA PARTING** — Contains less than one half of 1% silica, making it safe to use. It is clean because it is pure white.
- **STEVENS TRI-COTE CORE WASH—STEVENS EMERALD CORE WASH** – Being in paste form, these core washes are dustless in handling and in mixing.
- **STEVENS SLICK-SEAL MUDDING COMPOUND** – A paste type, ready to use product that creates no dust. Can be washed from the hands in plain water.
- **STEVENS #115, #125 AND NEW YELLOW JACKET CORE WASHES** – are clean to use because they are light in color.

For a cleaner foundry, consider using these Stevens products. Order trial quantities today or write direct for Technical Bulletin F-126, "Quick Steps to Cleanliness in the Foundry."

***BRANCHES:*** **BUFFALO • CLEVELAND • INDIANAPOLIS • NEW HAVEN**

FOUNDRY FACINGS | GRINDING OPERATIONS | BLAST FINISHING | BARREL TUMBLING | METAL CLEANING | POLISHING & BUFFING | AUTOMATIC FINISHING | AUTOMATIC PLATING | METAL RECLAMATION

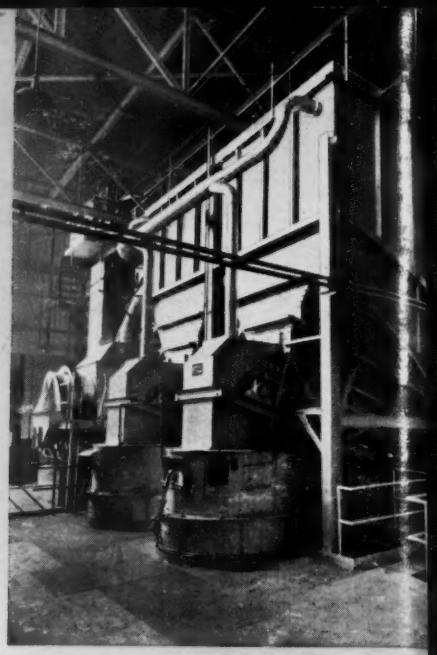
**Metal Finishing equipment and supplies from castings or stampings to finished product**

FREDERIC B. STEVENS

INCORPORATED

EVERYTHING FOR A FOUNDRY

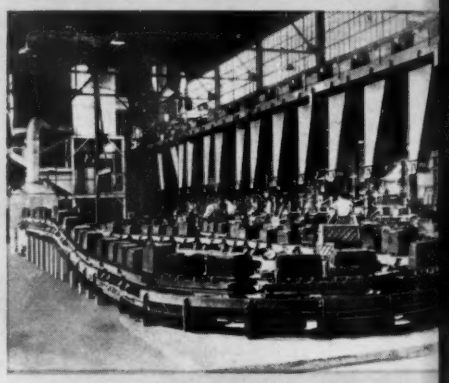
# Unit Responsibility



Compact Preparation Plant Showing Bins, Feeders and Mullers.

## For maximum economy and satisfaction use Bartlett-Snow's complete layout, design, engineering, fabrication and erection service

● Why buy a foundry the hard way? It actually *costs less* to have Bartlett-Snow handle the entire project. In addition, you get *experienced* help from *specialists* who are completely familiar with the most advanced techniques in this fast changing industry. Mountains of paper work and months of interviewing are eliminated. You make certain that each piece of equipment is co-ordinated and synchronized into a smooth running, efficient system. Costly field changes and modifications are minimized. You fix definite responsibility for both *delivery* and *performance.* Why buy *equipment* when you can buy *results*? We have been privileged to serve many of the country's best known, lowest cost foundries. May we serve you too?



Molding Line and Mold Conveyor in Jobbing Foundry.

Mold Conveyor in Large Automotive Foundry.

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